40 lock

POPULAR Computing WEEKLY

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This Week

News Desk

Dragon upgraded

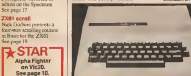
DRAGON will offer 64K upgrade for the Dragon at the same time as the disc drives are launched in late May

The upgrade will cost in the region of £70 and will take the form of a board swap of the main printed-circuit board This will be undertaken either by Dragon themselves or by a number of selected Dragon service agents

The reason for the upgrade is that when discs are added to the Dragon 32, followed by loading in the OS9 operating system and perhaps another language from disc, there is little user Ram left in which to write programs

The 64K version has the disadvantage that because of the chip combination used in the Dragon 32, the 16K Microsoft Basic in Rom overwrites 16K of Ram The way the Dragon s memory map is arranged means that the 16K overwritten is the third quarter of the 64K Ram What this means is that there is still only 32K of Ram addressable from the Basic — the remaining

Continued on page 5



Spectrum prices slashed

IN a swingeing series of price cuts, W H Smith has brought the Spectrum down under the £100 price barrier

The price of the 16K Spectrum drops from £125 to £99 95 With the Oric 16K machine still to appear, and the future launch of the Texet TX8000 uncertain, the Spectrum now becomes the first sub-£100 colour microcomputer

In addition W H Smith has cut the price of the two other Sinclair computers The 48K Spectrum comes down from £175 to £129 95 and the ZX81 drops to £39 95

These prices apply in W H Smith stores from April 26, and come into force a week before Sinclair s own price reduction is introduced on May 2

The price reduction bringing the 48K Spectrum down to under £130 will put pressure on other manufacturers to reduce their prices

Continued on page 5

Classified

Continued on page 38

★★ BRITAIN'S HOME COMPUTER WEEKLY ★★


WINDOW ON ANOTHER WORLD
Cruise through the deepest reaches of space in a life or death struggle to decide the fate of the galaxy. Match wits with mighty mages in the final battle for supremacy of the planet Xarg. Test your driving skills on the tracks at Monte Carlo and Monza. Or just relax on a Sunday afternoon with a round or two at your local golf course
Salamander Software offers a wide range of games for the Dragon 32, BBC Model B, Oric 1 and Tandy 32K microcomputers. Whatever your age, whatever your taste Salamander Software has the program for you! See us at the Midland Computer Fair Birmingham April 28-30
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BBC MODEL B
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How to submit articles
Articles which are submitted for publication should not be more than 3 000 words long The articles and any accompanying programs, should be original It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted

All submissions should be typed and a double space should be left between each line Please leave wide margins

Programs should whenever possible be computer printed

We cannot guarantee to return every submitted article or program so please keep a copy If you want to have your program returned you must include a stamped addressed envelope

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work.

This Week

Editorial

The microcomputer software industry is in something of a quandary

More and more issues are arising, such as piracy, protection and copyright, which require concerted policies on behalf of software companies The newly formed Computer Trade Association has made some moves towards the development of a united front, but the interests of its members appear to be too diverse for it to be effective

What the software companies need is a single body which can speak for all of them — a micro software association Such an organisation could lobby the relevant government departments and act as a spokesman on questions of illegal copying and international distribution

However, many software firms are both fiercely independent and highly competitive The idea of forming a joint association, which is both time-consuming and costly is anathema to some and reluctantly accepted by others

But, those firms opposed to an association should look at the example of the video industry Piracy is so common that it is becoming uneconomic for some companies to produce videos

I do not pretend that a micro software association would be the answer to all the industry's ills, but it would certainly help

Next Thursday

Knock all four monsters off the metal girders and win yourself a bonus — but watch out they don't knock you off first! Space Panic, next week's star game for the 16K Spectrum by C Williams.

Dragon upgrade

Continued from page 1

16K above the Basic can be used to store machine-code

'The 64K board really comes into its own when used in conjunction with the OS9 operating system and discs.' explained Dragon's marketing manager Richard Wadman "The 64K can then be used in several ways You can use the OS9 operating system to switch out the Microsoft Basic in Rom giving you a clear 64K soft machine Then you can load into the 64K from disc any operating system you like — Pascal Lisp C and so on

Alternatively because of the way the 6809 and SAM chips in the Dragon are configured, you can copy the 16K Microsoft Basic into a sensible position in the Ram giving you an uninterrupted 48K of user Ram addressable in Basic

Obviously the 64K board-swap is of less use if you don't have discs, but you can store machine code subroutines in the top 16K and then call them for use in a 32K Basic program

'Also, when you buy the 64K upgrade it will be supplied together with a cassette which will contain the software necessary to switch out the Basic Rom giving you a 64K soft machine and also to move the Microsoft out of Rom and into Ram, giving you 48K addressable by the Basic.

Spectrum prices

Continued from page 1

Commodore is looking closely at its strategy for the Vic20 — presently selling for £139 — and the price revisions may also bring problems for Acorn's new Electron machine, as yet unlaunched but expected to sell for around £150

Sord announces more low-cost machines this year

SORD has officially announced its M5 home computer in the UK and plans four more low-cost machines this year

The M5 home computer, originally planned for launch in November, will now go on sale in May And the price has been increased by £20 to £189 95

The Z80A-based M5 has 4K Ram and 16K video Ram An introductory Basic Rom cartridge, *Basic I*, is included in the price Other Basics will also be available for around £35 — *Basic G* a graphics package/picture editor and *Basic F*, a home business package The machine will also be expandable up to 32K in 16K units available in July

Takayoshi Shiina

Sord's President Takayoshi Shina in London to announce the M5 also gave details of four new low-cost computers planned for this year

These are (together with their proposed UK launch dates) the M2, a dedicated games machine with add-on computer keyboard option (August), the M5 Turbo an up-graded faster M5 with at least 64K Ram (October) the M9, a hand held computer with built-in microcassette unit and a 40x8 character display (September), and the M12 a 16-bit business system costing less than £300 (October)

Sord, Japan's fastest growing company, had a turn-over of £54m last year

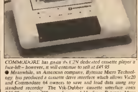
Computers get more funding

CAMPUTERS, manufacturer of the Lynx microcomputer has negotiated further financial backing for the company

"We have completed a deal involving substantial interim bank finance tied ultimately to an equity-based financing arrangement.' commented a Camputer's spokesman

The cash injection will be used to fund further development of the Lynx computer and to speed up the arrival of peripherals and software support for the computer

Dedicated cassette player gets a face-lift!



COMMODORE has given its C2N dedicated cassette player a face-lift – however, it will continue to sell at £45 95

● *Meanwhile, an American company, Bytesize Micro Technology has produced a cassette drive interface which allows Vic20 and Commodore 64 owners to save and load data using any standard recorder The Vik-Dubber cassette interface costs $36 95 – about £25 – and is available from Bytesize Micro Technology, PO Box 21123 Department GN, Seattle WA 98111, USA*

Spectrum is networked!

A LOCAL area networking system is being developed for the Sinclair Spectrum computer

The system will be included as part of the £30 Communications Interface needed to connect up the Microdrive units

The interface unit will have three functions — it will allow up to eight Sinclair Microdrive units to be connected to the Spectrum, it will include an RS232 interface and it will also have the networking facility

The Local Network will allow up to 64 Spectrums to be connected together using only a simple jack plug to jack-plug connection

Unlike a connection using the RS232 interface, the data transfer rate using the Local Network output is very fast, over 100K bits/sec This means, for example that to transfer a screen of information from one Spectrum to another will take under 1½ seconds

The communications interface unit will be available at the same time as the Microdrive units, now expected to go into production in May/June

Hitch-hikers writ served

A WRIT has been served on software company Supersoft by solicitors acting for Douglas Adams — author of *The Hitch hikers Guide to the Galaxy*

A High Court injunction is being sought to stop the sale of a computer game based on the book A spokesman for Adams claims that Supersoft does not have any rights to use the *Hitch-hikers* characters and events in a computer game (see *Popular Computing Weekly*, April 21)

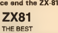
The inter-party injunction hearing at which both Adams and Supersoft will be able to present their case, is scheduled to be heard this Friday, April 29

At the time of going to press it was expected that Supersoft would defend the case although Supersoft's Peter Calver hoped "that a solution can be found before the case comes to court"









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Copyright protection

PJ Finn's letter in your 7-13 April issue highlights some of the current difficulties in the copyright law

The difficulties arise from the fact that the 1956 Copyright Act did not envisage computer programs However, the Whitford Committee on Copyright and Designs Law was of the opinion that programs are probably already protectable under the 1956 Act, although I believe I am correct in saying that this point has yet to be fully tested in the courts There is government sympathy with the Whitford view and it appears that the next Copyright Act (when we get it) will specifically make copyright protection available to authors of software

Given that computer programs are proper material for copyright protection it follows that an original compiler, being a program, will attract copyright protection in its own right The fact that it is a programming tool is irrelevant in the context of copyright

A compiled program that has within it recognisable parts of its compiler, without which parts it presumably would not run, would thus appear to attract two copyrights, one belonging to the author of the program and the other to the author of the compiler Unfortunately, the situation is not quite that simple For instance it could be argued that the author of a taped compiler for a home micro, by making his compiler available to the public is in effect giving a free licence to those who use the compiler to compile Basic programs for subsequent sale

I am not greatly persuaded by this argument for it may also be argued that the author of the compiler has expended great labour and skill in devising the compiler, that programs compiled by the compiler would not be saleable unless they were so compiled, and that the author of the compiler is therefore entitled to a royalty on the sales of the compiled program

In the case of manufacturers such as IBM, Honeywell ICL etc, it is reasonable to suppose that they keep control of their copyrights in compilers and other software by leasing and licensing arrangements

Comparisons of the above issues with "Picasso's paints" and "translators of Shakespeare" are irrelevant Artists' paints are not entities which attract copyright The translator of a literary work has copyright in his translation, irrespective of the existence of copyright in the original

T C Jennings
101 Smyth Road
Ashton
Bristol BS3 2DR

Elusive Microdrive

Are you one of the many thousands? Do you wake up in the morning, take out your prayer mats, kneel down and face Cambridge? Do you carry a cheque made out to Sinclair Research, waiting to be sent? If you do, then you must be like myself, waiting for the elusive Microdrive, the one we all know (or would like to know) and love

I am sure that even Uncle Clive is well aware that when his new baby hits the market there will be a massive response from Spectrum owners rushing to join their places in the queue

But what new goodies will appear on the horizon when software loading and saving are greatly speeded up? Can we expect practical business software so we can justify to our relatives and friends that our pride and joy is not just another video game?

Just to finish my look into the crystal ball, who will be the first manufacturer to produce a dot matrix printer in the £150-£200 price range which will run from an RS232 interface and do they have any shares for sale?

N Murray
39b St Thomas Street
Weymouth
Dorset DT4 8EH

Delays and excuses . . .

Further to the letter from Roger Vellacott of East London Robotics, published in your 31 March issue, I thought you might be interested in my experience with ELR

I originally ordered a 32K memory extension for my issue I Spectrum on 9 February 1983 Since then the catalogue of delays and excuses has been as follows

1) 2 March 1983 — phoned ELR to ask when delivery would be made, and was told I would receive the goods within two weeks
2) 18 March 1983 — received letter from ELR stating that, "we will have fulfilled all our outstanding orders by the end of the first week in April"
3) 7 April 1983 — phoned ELR again to ask when their first week in April would end, and was told that my order had been sent "a few days ago"
4) 11 April 1983 — phone ELR again, only to be told that all their outstanding orders would be sent out "sometime in the next week" When I asked why I had been told my order was already on its way, the replay was, "well, we've had some problems"

So, now I am still waiting for my order to be dispatched 61 days after placing it I doubt if this saga will end for some time yet but I will keep you informed of further delays

A J Prestwich
10 Oban Rd
Southend on Sea
Essex SS2 4JL

Another jar of coffee . . .

We would like to announce the birth of *Imagical Software*, the name of the game through the door to another dimlusion

Like all good companies, we started life in a potting shed in the slums of Calcutta with just one employee, two fish and a loaf of bread which we swopped with a consortium of 5 000 people for an old 1K ZX80 We couldn't afford any software for it, so we started to write our own, and soon realised that the shortage of commercial software was so bad that people would pay good cash for crude Basic *Hangman* programs

We put together a cassette with over 50 different programs on it — each one a *Hangman* with a different word We started off small with a classified ad in the Jerusalem Pig Breeder's Gazette and soon sold the cassette, so we made up another one Pretty soon we were working at the computer all night just to satisfy demand and soon realised that we'd have to go out and buy another jar of coffee and some new batteries for the tape recorder

We have gone from strength to strength since those days and now have a staff of over 2,000 (we like to keep it small) None of us are over 16½ and our projected sales for 1983 are around £200 million We have a dedicated team of programmers who are earning on average about £250 000 a year, and we expect them to produce about 10 new titles each week

A typical program will sell about 20 000 cassettes in the first week to the chain stores, with another 40-50,000 a week or two later We reckon that our Spectrum programs will sell around 500 000 copies (two to each Spectrum owner) before they die', and we have a strict policy of never advertising a game more than three months before we design it

Incidentally, all of our programmers are wide open to lots of interviews with the press

As a sideline to our software, we are developing a new microcomputer called the Binatone — activision electron The computer will have 256 colours, resolution of 1024 × 2048 pixels 64K Ram a built-in flat screen tv with a pair of microdrives with interchangable storage medium (available later this year) It will draw oval circles and will have the usual modem, prestel interface and hole in the 'typewriter-pitch keyboard to stop it from overheating and possibly for add-on cartridges

Also "coming soon" is a 'tube' which lets you interface your micro to the Cray-1 mainframe at Harwell The machine is available now (please allow 28 weeks for delivery and postal delays) and the ULA and manual will be available from Christmas on a restricted basis to the first 5 000 mail-order customers The price is £40 for the basic model and £60 for the luxury medel with connecting leads to the tv and tape-recorder

Clive Curry
Chief Executive &
Marketing Manager
Imagical Software
Timbucktoo

Alpha Fighter

A new game for the Vic20 by A Petts

In this game for Vic20 + 3K Ram you control a plane which you have to steer through the oncoming rocks, shooting supply pods and invaders. You can use the keyboard or joystick controls, but the joystick is better because you can use the diagonal controls.

The game can be made easier by raising the 15 in line 160, to decrease the amount of rocks or lower the 30 in line 165 to increase the amount of supply pods.

The program uses user defined graphics and a small machine code routine which is entered from data statements the first time the game is played — the machine code routine moves the rocks, supply pods and the invaders bombs. The assembly code goes as follows and is entered between 838 and 869

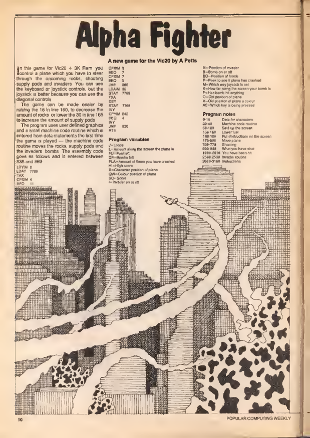
```
LDYIM 0
LDAY  7789
TAX
CPXIM 4
BEQ   11
CPXIM 3
BEQ   7
CPXIM 7
BEQ   5
JMP   860
LDAIM 32
STAY  7789
TXA
DEY
STAY  7788
INY
CPYIM 242
BEQ   4
INY
JMP   830
RTS
```

Program variables

J=Loops
L=Amount along the screen the plane is
FU=Fuel left
OF=Bombs left
PLA=Amount of times you have crashed
HI=High score
X=Character position of plane
QW=Colour position of plane
SC=Score
I=Invader on or off
I1=Position of invader
B=Bomb on or off
BO=Position of bomb
P=Peek to see if plane has crashed
M=Which way joystick is set
K=How far along the screen your bomb is
F=Has bomb hit anything
O=Old position of plane
V=Old position of plane a colour
A£=Which key is being pressed

Program notes

0-16	Data for characters
20-40	Machine code routine
50-120	Sets up the screen
150 158	Lower fuel
160 169	Put obstructions on the screen
175-598	Move plane
750-779	Shooting
900-930	What you have shot
1000-2016	You have been hit
2500 2530	Invader routine
3000-3160	Instructions



```
READY.
0 DATA96,200,240,216,143,255,254,127
1 DATA0,0,1,2,252,30,20,255
2 DATA0,0,192,32,152,204,255,255
3 DATA16,16,56,254,56,16,16,0
4 DATA0,12,31,63,126,120,50,24
5 DATA0,54,54,190,255,190,64,54
6 DATA199,153,255,189,153,36,56,189
7 DATA0,10,20,40,190,40,20,10
8 DATA145,92,0,195,0,74,13,7
9 DATA0,0,0,0,0,0,0,0
10 FORJ=0TO79:READA:POKE7168+J,A:NEXT
20 POKE36869,255:FU=50:POKE37154,127:L=0:POKE36879,
   25:DF=5:PLA=1
30 DATA158,0,195,99,30,170,234,4,240,11,254,3,240,7,
   224,7,240,3,70,92,3,169,9,153,90,30
35 DATA130,136,153,89,30,200,192,242,240,4,200,70,62,
   3,56,32,32
40 FORJ=828TO828+42:READA:POKEJ,A:NEXT
45 GOSUB3000:POKE650,255
46 POKE900,0:POKE901,0
50 PRINT"BATTLE COMPUTER"
53 HI=PEEK(900)*256+PEEK(901):PLA=1
55 PRINT" PLANE 1"
58 PRINT"
70 PRINT"
90 PRINT" SCORE     = 0"
98 PRINT" FUEL      = 50"
100 PRINT" HI SCORE =";HI
120 FORJ=7769TO7769+240:POKEJ,9:POKEJ+30720,0:NEXT
130 X=7844:FU=50:DF=5:L=0
140 POKEX,2:POKEX-1,1:POKEX-2,0:QW=X+30720:POKEQW,6:
    POKEQW-1,6:POKEQW-2,6
150 SYS(828)
154 IFFU>5ANDFU<6THENPOKE36875,230
155 FU=FU-.2:PRINT"";
    INT(FU);"  ":IFFU<=0THEN2000
156 IFB=1THENGOSUB750
157 IFFU<6THENPOKE36879,26:POKE36878,0:PRINT"
    LOW FUEL     "
158 IFFU>5THENPOKE36879,25:POKE36875,0
160 IFINT(RND(1)*15)=7THENPOKE7769+241,4
165 IFINT(RND(1)*30)=10THENPOKE7769+242,3
167 IFI=0ANDINT(RND(1)*50)=20THENI=1:I1=7769+L+2:
    POKEI1,6:GOTO170
168 IFI=1THENGOSUB2500
170 P=PEEK(X):IFP<>2THENGOSUB1000
172 POKE36877,200:POKE36874,200:POKE36878,4
175 M=PEEK(37137)+PEEK(37153)
176 A=PEEK(197):IFM<>373ORA<>64THENGOSUB500
180 GOTO150
500 O=X:LO=L
505 IFA=369ORA=51THENX=X-22
510 IFM=365ORA=26THENX=X+22
520 IFA=357ANDL>0ORA=43ANDL>0THENX=X-1:L=L-1
528 IFA=245ANDL<19ORA=20ANDL<19THENX=X+1:L=L+1
530 IFM=237ANDL<19THENX=X+23:L=L+1
535 IFM=241ANDL<19THENX=X-21:L=L+1
540 IFM=349ANDL>0THENX=X+21:L=L-1
545 IFM=353ANDL>0THENX=X-23:L=L-1
547 IFA=32ANDB=0ANDDF>0THENDF=DF-1:PRINT" "
    ;DF;" BOMBS LEFT ":B=1:BO=X+1:GOTO700
556 IFM=341ANDB=0ANDDF>0THENDF=DF-1:PRINT" ";DF;
    " BOMBS LEFT ":B=1:BO=X+1:GOTO700
576 IFX>7769+240ORX<7771THENX=O:L=LO:RETURN
585 POKEO,9:POKEO-1,9:POKEO-2,9:V=O+30720:POKEV,0:
    POKEV-1,0:POKEV-2,0
595 P=PEEK(X)+PEEK(X-1)+PEEK(X-2):IFP<>27THEN1000
597 POKEX,2:POKEX-1,1:POKEX-2,0:QW=X+30720:POKEQW,6:
    POKEQW-1,6:POKEQW-2,6
598 RETURN
700 B=1:BO=X+1:K=0:IFDF=1THENPOKE36877,0:POKE36878,15
    :FORJ=128TO255:POKE36875,J
710 IFDF=1THENNEXT:POKE36878,0:POKE36875,0:PRINT"
    SHOOT 'SC'     "
720 POKE36875,15:POKE36877,200:POKE36878,3:POKE36877,0
750 IFK>16-LTHENB=0:POKEBO,9:RETURN
755 IFPEEK(BO)<>5ANDPEEK(BO)<>9THEN800
760 K=K+1:POKEBO,9:BO=BO+1:IFPEEK(BO)<>9THEN800
765 POKEBO,5
770 RETURN
800 F=PEEK(BO):POKEBO,0:B=0
810 IFF=3THENFU=FU+10:DF=DF+3:PRINT"EXTRA
    FUEL        ":IFDF>5THENDF=5
813 IFF=3THENSC=SC+15:PRINT"
    ";SC
815 IFF=3THENPOKE36876,200:POKE36877,0:POKE36874,0
820 IFF=3THENFORJ=1TO4:FORJ1=1TO15:POKE36878,J1:NEXT:
    FORJ1=15TO1:POKE36878,J1:NEXT:NEXT
830 IFF=3THENPOKE36876,0:POKE36878,4:POKE36877,200
840 PRINT"                     ";DF;"
    BOMBS LEFT"
845 IFF=3THEN850
846 IFBO=I1THENSC=SC+100:PRINT"
    ";SC:I=0:POKEI1+30720,0
847 POKE36874,0
850 POKE36878,15:POKE36877,200:FORJ=1TO100:NEXT:
    POKE36877,150:FORJ=1TO150:NEXT
855 POKE36877,0
860 IFF=4THENPOKEBO,4:RETURN
870 IFF=7THENSC=SC+5:PRINT"
    ";SC
880 POKEBO,9:RETURN
1000 POKE36876,0:POKE36877,200:FORJ=15TO0STEP-1:
     POKE36878,J:SYS828:FORK=1TO100
1001 NEXT:NEXT:I=0:POKEI1,9:POKEI1+30720,0
1010 PLA=PLA+1
1015 POKE36878,15:POKE36877,0:POKE36876,200
1020 POKEX,2
1030 POKEX,9:POKEX-1,9:POKEX-2,9
1035 IFX>7769+240THENGOTO1060
1040 X=X+22:POKEX,2:POKEX-1,1:POKEX-2,0
1050 SYS(828)
1053 K=PEEK(36876)-2:POKE36876,K:FORK=1TO140:NEXT:
     IFFU>0THENPRINT"CRASHED
1054 SYS(828)
1055 GOTO1030
1060 POKE36876,0
1063 POKE36877,200:FORJ=15TO0STEP-1:POKE36878,J:SYS828
     :FORK=1TO200:NEXT:NEXT:POKE36877,0
1064 POKE36878,0
1065 FORJ=1TO240
1070 POKEX,2:POKEX-1,1:POKEX-2,0
1075 A=INT(RND(1)*8):QW=X+30720:POKEQW,A:POKEQW-1,
     A:POKEQW-2,A
1080 SYS(828):NEXT:POKEQW,1:POKEQW-1,1:POKEQW-2,1
1090 POKEX,9:POKEX-1,9:POKEX-2,9:POKE8024+30720,1
1095 PRINT"                  ":POKE36878,0:
     POKE36877,0:POKE36874,0
1097 SC=SC+INT(FU):PRINT"
     ";SC
1098 IFPLA=4ANDSC=>800THENPRINT" EXTRA";
     FORJ=1TO400:NEXT:GOTO130
1100 IFPLA<4THENPRINT"PLANE";PLA:FORJ=1TO400
     :NEXT:GOTO130
1200 PRINT"  GAME OVER"
1210 PRINT"PRESS A KEY "
1215 POKE198,0:WAIT198,1:POKE198,0:POKE36878,0:
     POKE36876,0:POKE36877,0
1220 IFSC>HITHENHI=SC
1225 H=INT(HI/256):H2=HI-H*256:POKE900,H:POKE901,H2
1230 RUN50
2000 PRINT"OUT OF FUEL     "
2010 POKE36878,0:FORJ=1TO500:NEXT:GOTO1000
2500 POKEI1,9:POKEI1+30720,0:I1=I1+INT(RND(1)*3)+21:
     POKEI1+30720,2
2505 IFI1>7769+240THENI=0:POKEI1+30720,1:RETURN
2510 POKEI1,6:IFINT(RND(1)*3)=2THENPOKEI1-1,7
2520 IFI1=XORI1=X-1ORI1=X-2THEN1000
2530 RETURN
3000 POKE36879,25:PRINT"     ALPHA FIGHTER"
3005 PRINT"
3010 PRINT" YOU ARE IN CONTROL OFA NEW FIGHTER
     PLANE   CALLED ALPHA "
3020 PRINT" YOU HAVE HIT A TIME  WARP AND MUST
     AVOID   THE ROCKS."
3030 PRINT" YOU MUST HIT THE      SUPPLY PODS FOR
     FUEL  AND BOMBS "
3040 PRINT" YOU CAN ONLY CARRY 5 BOMBS."
3050 PRINT" WATCH FOR THE INVADER,IT IS A GOOD SHOT."
3060 PRINT" USE YOUR JOYSTICK OR  KEYS:U,H,J,N,&
     SPACE  TO FIRE "
3070 PRINT" PRESS A KEY"
3080 POKE198,0:WAIT198,1:POKE198,0
3090 PRINT" = YOUR PLANE"
3100 PRINT" - SUPPLY POD:15 PTS.";
3110 PRINT" ROCK:INDESTRUCTABLE"
3120 PRINT"F = INVADER:100 PTS"
3130 PRINT" = ITS BOMB:5 PTS"
3135 PRINT"EXTRA PLANE AT 800 PTS"
3140 PRINT"   GOOD LUCK!"
3145 PRINT" HIT A KEY"
3150 WAIT198,1:POKE198,0
3160 RETURN
```


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Literary leanings . . .

***David Kelly** talks to literary agent, Richard Gollner about the computer books scene*

The phone rings and Richard Gollner picks it up. "Hello! Where are you? Above the snow line? There could be a novel in there!"

Richard Gollner has been a literary agent for 13 years now. For the last three he has specialised in the flourishing business of computer publishing. He has over 40 computer authors under his wing with over 100 books, many of which are best sellers.

As a literary agent, his job is to represent the interests of his clients in their dealings with publishers — making sure that the author gets the best deal and that the publisher gets presented with a manuscript in the right format. He also scans the press every week and attends computer shows — some 20 a year — both here and in the US, to keep up with the latest developments. In this way he keeps his authors informed of new machines, likely launch dates and so on.

The ZX80 machine came out three years ago and ever since there has been a mass market for computer books. The result has been an almost unseemly blossoming of the printed word — there are now, for example, more than 30 books on the Spectrum.

"The reason that this whole computer book industry has sprung up is because the manuals supplied with these new computers were written by the wrong people. The authors knew too much about computers and so failed completely to address the first-time user. All the best selling books in the last couple of years can be described as manual substitute books.

"In addition, because the manuals are not available separately from the machines, books are one of the few ways of finding out which computer to buy. People consider it worthwhile to spend five or six pounds on a book to find out what a machine can really do, instead of spending three to four hundred pounds only to find out what they have bought is not enough.

"Interface sold 5,000 copies of their first Vic20 book before the first Vic was distributed in the UK.

"The books scene can only ever be a rather good reflection of the hardware scene. Any advice I might give to publishers and authors is directly related to the price, popularity and actual numbers of the machine sold.

"The hardware scene can perhaps be compared with the first days of Hollywood. There are thousands of people who, months ago, were doing something else — now they are designing, selling and promoting computers. Nobody's pedigree is longer than about three years. And the same is true of both computer publishers and authors.

"From the publisher's point of view computer books present some special problems — problems which have meant that to a large extent the more established companies have not become involved.

"Traditional publishers do not react very quickly. Sometimes the optimum sales 'window' for a book can be as little as two months. Publish too soon and there is not enough interest in the machine. Publish too late and there may be too many books already available for that machine. I'm not saying that the book will then fail — it just won't do as well. Traditional publishers find the time scales difficult to cope with.

"Half my authors are taking their 'O' levels!"

"The reason that small independent publishing houses have been able to get a significantly large toe-hold in the market is because the major UK publishers also feel that in order to do computer books justice the buying-in price is rather high. What they mean by that is that to build up a range of titles requires a significant investment — you need at least a good commissioning editor and one or two advisers who can supplement the help from agents such as myself.

"The most extraordinary thing about this industry is that there are no personalities. Everything else that publishers do has a pedigree and well known authors — think of anything, cookery, art. Not computing.

"Over 50 percent of my authors are this year taking their 'O' levels! Funnily enough, the number one requirement for writing books like this is not the ability to construct sentences or an ability to spell — but instead a background of original creative programming. It is always much better to have a fairly well written original program than a brilliantly written derivative program. In books, as in software, you can go from *Frogger* to *Mogger Blogger Dogger*.

"If someone writes a book and it is sold well, both here and abroad, by reputable publishers who know their business then the author will not only get a largish advance — at least £1,000 — while the book is being written, but will also get a steady income for two to three years after the book goes on sale.

"Usually an author will get about 7 percent of the sale price of a book as a royalty. If the book is good, it will sell in large quantities. Fontana's paperback *Better Programming For Your ZX81 and Spectrum* by Robert Speel has now sold over 50,000 copies.

"After the author's percentage, the bookseller gets about 35 percent and the publisher ends up — after taking off expenses such as production costs (typesetting, printing, jacket design) and the cost of keeping a fleet of raps on the road — with about the same as the author.

"At best, publishing is a get-rich slow scheme," says Gollner.

One reason that independent British publishers have flourished is the strength of the home micro market. This also accounts for American publishers like Linsac and Time Data being quick to pick up on British authors — the Spectrum has already been around in the UK a year and it still hasn't gone on sale in the US.

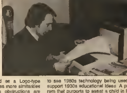
"Sadly, I would say that I don't see any more major machines going from the UK to the US. We are by degrees losing the initiative and I see it as my responsibility to my authors to regularly visit the US to bring back news, manuals and new machines. I have to make an informed guess of how many books and of what level the sales of specific machines will support. That is my job. And it is perhaps one of the reasons that no other agency has taken the course that we have."

Richard grins. "If I had been a really successful agent three years ago then I wouldn't have had time for this now. But I was only doing fine — so now I'm still doing fine but I'm a lot busier than I was."



School lessons!

***John Scriven** looks at some of the educational software available for the BBC micro*



The availability of the BBC micro its inclusion in the Department of Industry's list of subsidised computers for schools, and its starring role in several tv series have ensured it a place in most schools in the country Many parents will also acquire the 'Beeb' in response to Acorn's advertising which portrays this micro as the only machine that can be termed truly "educational

At this level, the quality of the software available is an important consideration Software for the BBC micro has to be viewed in two lights firstly, that which is useful at home and secondly, that which is useful at school. This distinction has to be made for the main reason that whereas the user-computer ratio at home is usually 1 or 2 to 1, there are few schools that can afford the luxury of such a figure Indeed, the DoI scheme seems like a crust of bread offered to a starving man — it helps, but only just In an average primary school of 250 children even two micros do not go very far and the way they are used is determined by this fact

Every machine purchased under the DoI scheme comes with a software pack provided by the Microelectronics Education Programme The programs in the primary pack are an improvement on their secondary counterparts but some still deserve the comment 'could do better' *Factfile* is a good introduction to databases and allows the generation of datafiles on any subject These can in turn be interrogated and show the many advantages over card based systems The file provided contains information on dinosaurs and is the sort of material that can be accessed by a whole class or groups working on a project

Crash is presented as a Logo-type program, but in fact has more similarities with Bigtrak Various obstructions are shown on a grid, and the object is to negotiate different courses to reach the target This can be achieved by entering a string of commands eg 5 forwards, left 4 forwards right etc This is not as much fun as turtle graphics on Logo and is educationally inferior to actually using a programmable toy like Bigtrak

Diet allows you to enter all the food you have gorged through the day and then tells you how this compares with an ideal diet Apart from upsetting any anorexic children, the language and concepts are much too advanced for all but a few able children in most primary schools

High speed dash for the shopping!

A program designed specifically for primary children should be an improvement, but this is not the case with *Shopping* which simulates a high-speed dash to collect the items on a shopping list. The graphics are very good, but the exercise could be achieved more enjoyably with plastic or real money and a traditional class shop I think the main point about programs like this is that they tie up an expensive piece of equipment like a micro doing something that can be achieved just as well with far cheaper things

Of the other programs in the pack (two-thirds of which are still unobtainable), *Animal* seems to use the computer more wisely The program only 'knows' two animals to begin with as you choose others they are added to the database, along with relevant questions eg

Does it live in water?
Is it a blackbird?
NO
What is it?
A FERRET
What question should I ask to tell it from blackbird?
DOES IT PUT THE WIND UP RABBITS?! etc

With my criticisms so far, it may seem that the "private sector" of software houses would have no difficulty in producing high-quality software Unfortunately, this is not always the case

Because simple linear programs using a drill-type format are easy to write they tend to appear frequently It is depressing to see 1980s technology being used to support 1930s educational ideas A program that purports to assist a child in long multiplication, for instance may succeed in reinforcing the methods used, but it cannot assist in understanding, and therefore in true learning

Here then, are some programs that demonstrate what can be done with the BBC machine I imagine someone thought that *Simon*, the colour and music memory game was too simple — hence the name *Pieman* from Musicsoft This well-written game runs on a model B There are five options that increase in difficulty Game 1 divides the screen into four coloured sections that flash and produce a tone The object is to repeat a sequence by pressing the correct keys This can be done by memorising the colours, their position, or the notes that go with them This is a practice level, so it's wise not to get too big headed

Game 2 increases the number of notes in the sequence until you make a mistake Game 3 increases the selection of sounds to the five pentatonic notes and Game 4 includes a whole major scale

The ultimate game is number 5 A multicoloured pie appears on the screen like a large 50 pence coin, and each of the slices has a note and a colour to itself This is an ambitious level to choose and is rather difficult

Swiftlink Software has produced a tape containing several programs *The Count's Castle* lets you help the wizard from numberland defeat the wicked count. The educational aspects are concealed in a game that consists of moving a small figure through some trees to the castle On the way, you have to answer some arithmetic questions The language is simple and the cassette is aimed at schools rather than home use, as the message "tell your teacher' appears if you are foolish enough to hit escape

All the sums are very basic, of the form 2 + 3 = ?, but they are mixed in with simple multiplications and subtractions Although these could be easily changed as they are held in Data statements, there are no instructions on doing this It is more likely that a teacher using this program would

want more control over the questions presented

The *Black Tower* involves assisting an alien take a lift to the top of a tower block by answering similar questions to the first game. *Dragon's Cave* however, provides a more useful method of learning times tables. The cursor keys are used to steer a course through the multiples of the chosen table which are laid out in random order. This is a novel approach to a familiar subject and raises the program above the rest.

Invisible Snakes and Ladders sounded exciting. A 10 x 10 board appears and instead of throwing a die, you enter any number between 1 and 6. The snakes and ladders appear briefly as you make your move so it seems that this is a memory test of their position. Unfortunately they appear at random at each turn, so the result is left purely to chance. Ultimately, then a rather weak finish after a promising start.

This cassette could be used at home, but is of limited value at school, unless you are prepared to tailor it to your own requirements.

Little 'holidays' in the middle of 'work'

Cottage Software has released a cassette with *Multiply* on one side and *Divide* on the other. Someone has obviously spent a long time writing these programs which use double-height numbers to illustrate "long" methods in multiplication and division and lead the user to make the correct responses.

Although they illustrate what computers can do, there are few schools that can justify one child using a micro to run through programs such as these. More importantly they do not attempt to show pictorially what is happening, so the child is simply manipulating symbols on the screen.

Occasionally, the opportunity occurs to play noughts and crosses or hangman, which acts as an incentive but these diversions would be more useful as part of the main program rather than little "holidays" in the middle of "work". Children easily get bored with this type of program and would be tempted to press the *Break* and *Escape* keys which were not disabled. Not, I am afraid, my favourite cassette, although there may be some rich traditionalist somewhere who thinks it's marvellous.

H & H Software produce a variety of software for the BBC machine, and I am glad to say that most of it shows a good deal of thought about what constitutes a useful program. *Early One* is designed for children just starting to read. The child has to match pictures with first letters, then words. The cursor keys are used to select the correct response, so possible confusion between lower case letters on the screen and upper case on the keyboard is avoided. After five pictures, the child is given the opportunity to match nursery rhyme tunes with pictures.

The difficulty level rises automatically with correct responses, or intermediate stages can be selected. This tape is good value and would be useful at home, or in a school that has more than one micro.

Signals and *Magic* appear on one tape, again from H & H Software. *Signals* requires the input of an even and an odd number: eg, 2 and 3. The computer displays 2 2 3 3. From these four numbers, you have to make all the numbers from 1 to 20. This can be achieved by using brackets and exponents. For example, 20 = 2*3*3+2 and 19 = 2*3*2+3.

After each turn, a road sign appears bit by bit, and you can guess which it is from a selection on the screen. The object is to score high points which are recorded at the end of the game.

Magic presents incomplete magic squares on the screen. As they are completed, so another appears until they are rather difficult (try adding 56 + 63 + 57 + 68 in your head!). Only 10 minutes are allowed and the time taken appears on the screen. These seem like an excellent pair of programs to speed up mental processes, and would work well in school or at home.

The final cassette from H & H contains two more original programs, *Shape* and *Race*. *Shape* is a geometry game for two players. A large container appears inside which bounces a dotted line. When it collides with an invisible shape it bounces off with a "ping".

When either player thinks he can guess the shape, he stops the game and a menu of shape names appears at the side of the screen. If the correct guess is entered, then points are added according to how much time has been taken. If incorrect, the points are subtracted. There is a wide selection of polygons to choose from, and the program makes learning the difficult names a more pleasant task.

Race is an interesting variation on *Nim*. A course of numbers from 0 to 100 is set out. You play against the computer in choosing how many numbers to move on each turn. At the start, you can choose a limit to the size of jumps and the object is to be the one who arrives home first. This involves strategy, thinking ahead, and the ability to add numbers quickly and accurately — all very worthwhile achievements and a demonstration of how a micro can be used sensibly — not to replace the teacher or parent, but as yet another tool to encourage enthusiastic learning. ■

Firm	Program	Cost
Musicsoft 12 Fallowfield Ampthill Beds	*Pieman*	£3.50
Cottage Software Heather Cottage Sally Hill Whitby North Yorks	*Cassette 3*	[illegible]
Swift Link Software 118/120 Wardour Street London W1	*Invisible Snakes & Ladders* *Cassette 2*	[illegible] [illegible]
H & H Software 53 Holloway Runcorn Cheshire	*Shape & Race* *Signals & Magic* *Early One*	[illegible] [illegible] [illegible]

Programs from the DoI scheme supplied as part of a government sponsored package. More details from Microelectronics Education Programme or from the Council for Educational Technology, 3 Devonshire Street, London W1N 2BA

Squared!

***Chris Seely** presents a program to show Pythagoras theorem in action*

This program allows the user to work out the length of any side of a right-angled triangle using Pythagoras theorem (that the square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the other two sides)

If you don't know how the theory of Pythagoras works then don't worry because the Spectrum uses an on-screen display to show its working out of the sums and the answer

Try this for a test program press "P" for the menu choices then for the length of side 'B' enter 4 and for the length of 'C' enter 3 The Spectrum will then explain how it is working out the sum In fact it is carrying out this equation

$$\sqrt{B^2 + C^2 = A}$$

which is B squared plus C squared = A squared The computer then works out the square root of A squared, which gives A, ie the length of side 'A', which the Spectrum has displayed along with all the other lengths of sides on the triangle ●

```
Theory of Pythagoras in action:-
[redacted]
a          b
      c
Now,to find the length of side a
we first multiply sides b & c by
themselves,& then add them up.
Like This -
4(Length of side b)*4=16      +
3(Length of side c)*3=9       =
[redacted]
a=5          b=4
      c=3
16(b*b)+9(c*c)=25
Now find the SQUARE ROOT of 25
The square root of 25 is 5
Therefore length of side a=5
```

```
The Program
 100 REM ************************
 110 REM *Theory Of Pythagoras*
 120 REM ************************
 130
 140 REM ************************
 150 REM *Program By C.Seeley*
 160 REM ************************
 170
 180 PRINT FLASH 1,"PUT ""CAPS
LOCK"" ON"'"THEN PRESS [redacted] "
 190 INPUT P$
1000 BORDER 1: PAPER 1: INK 4: B
RIGHT 1: CLS : BEEP .1,15
1010 PLOT 80,90
1020 DRAW 80,0
1030 DRAW 0,80
1040 DRAW -80,-80
1050 PLOT 150,90
1060 DRAW 0,8
1070 DRAW 9,8
1080 PRINT AT 8,13,"a"
1090 PRINT AT 8,21,"b"
1100 PRINT AT 11,15,"c"
1110 PRINT ' INVERSE 1," PRESS T
HE RELAVENT CHOICE KEY "
1120 PRINT '""""P""PYTHAGORAS HYP
OTENUSE THEORUM"
1130 PRINT '"""C""PYTHAGORAS RIG
HT ANGLED LINESTHEORUM"
1140 IF INKEY$="" THEN GO TO 114
0
1150 IF INKEY$="P" THEN GO SUB 1
500
1160 IF INKEY$="C" THEN GO SUB 2
000
1170 GO TO 1000
1500 GO SUB 5000
1510 PRINT AT 15,0,"Length of si
de b? ",: INPUT B: PRINT B
1520 PRINT '"Length of side c? "
,: INPUT C: PRINT C
1530 PRINT AT 20,10,"THANKYOU":
PAUSE 50: GO SUB 5000
1540 PRINT AT 13,0,"Now,to find
the length of side awe first mut
tiply sides b & c bythemselves,&
 then add them up."'"Like This -
"
1550 PRINT 'B,"(Length of side b
)*",B," =",B↑2,"      +"
1560 PRINT 'C,"(Length of side c
)*",C," =",C↑2,"      ="
1570 PRINT AT 0,0, INVERSE 1,"PR
ESS ANY KEY TO  "' SOLVE THE EQU
ATION"
1580 PAUSE 0
1590 GO SUB 5000
1600 PRINT AT 13,0,b↑2,"(b*b)+",
c↑2,"(c*c)=",b↑2+c↑2
1610 PRINT ''Now find the SQUARE
 ROOT of ",b↑2+c↑2
1620 PRINT '"The square root of
",b↑2+c↑2," is ",SQR (b↑2+c↑2)
1630 PRINT '"Therefore length of
 side a=", FLASH 1,SQR (b↑2+c↑2)
1640 PRINT AT 8,21,"b=",B,AT 11,
15,"c=",C,AT 8,8,       ",AT 8,8
, FLASH 1,"a=",SQR (B↑2+C↑2)
1650 PRINT AT 0,0, INVERSE 1,"AN
Y KEY TO RUN    "' AGAIN
     REM 13 SPACES
1660 PAUSE 0: RETURN
2000 GO SUB 5000
2010 PRINT AT 13,0,"Length of si
de A? ",: INPUT A: PRINT A
2020 PRINT '"Which side do you R
EQUIRE the   length of? ",: INPU
T s$: PRINT s$
2030 IF s$="B" THEN LET c$="C"
2040 IF s$="C" THEN LET c$="B"
2050 PAUSE 20: PRINT AT 15,0," ..
.
2070 PRINT AT 15,0;"Length of si
de ",c$," ? ",
2080 INPUT cs: PRINT cs
2090 PRINT AT 20,10,"THANKYOU":
PAUSE 50
2100 GO SUB 5000
2110 PRINT AT 13,0,"Now,to find
the length of  side ",s$,",we mu
st multiply the length ofside A
 by itself,and then mult-iply si
de ",c$," by itself, and then SU
BTRACT ",c$," from A."'"Like thi
s -"
2160 PRINT 'A,"(Length of side A
)*",A,"=(",A↑2,") -"'cs,"(Length
 of side ",s$,")*",cs,"=(",cs↑2
,") =", FLASH 1,A↑2-cs↑2
2170 PRINT AT 0,0, INVERSE 1,"PR
ESS ANY KEY TO  "'"CARRY OUT EQU
ATION"
2178 PAUSE 0: GO SUB 5000
2180 PRINT AT 13,0,"Now we find
the square root of ",A↑2-cs↑2'
"Which is -"'SQR (A↑2-cs↑2)
2190 PRINT ''Therefore the lengt
h of side ",s$,"  = ", FLASH 1,S
QR (A↑2-cs↑2)
2240 PRINT AT 0,0, INVERSE 1,"AN
Y KEY TO RETURN "' TO THE MENU
"
2250 PAUSE 0: RETURN
5000 FOR I=13 TO 21: PRINT AT I,
0,"
 ": NEXT I
5010 RETURN
```

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Round and round, up and down

***Nick Godwin** presents a Basic four-way scrolling routine for the ZX81*

Scrolling can be both a useful tool for program construction and also can be used to good effect during program operation. There are various methods of *Scrolling* using machine-code techniques, but those described here rely entirely upon Basic.

The disadvantages of relying solely upon the *Scroll* function built into the ZX81 are as follows. (i) Only one direction is available (upward). (ii) The top line is lost. (iii) The bottom line is upset in the display file.

One way of dealing with the second of these is to collect the top line into a string reserved for that purpose. Assuming the *Scroll* statement to be on line 200, this can be done as follows:

```
140 LET X$ = ""
150 INPUT Y$
160 LET Q = PEEK 16396 + 256 × PEEK 16397 + 1
170 FOR Q = Q TO Q + 31
180 LET X$ = X$ + CHR$ PEEK Q
190 NEXT Q
200 SCROLL



220 GOTO 150
```

The third disadvantage can be dealt with by adding the following two lines:

```
100 DIM Y$(32)
210 PRINT Y$
```

This system, although it works perfectly well, has a major disadvantage if *Scrolling* is required as part of an operating program—it is slow. In addition, it limits the *Scroll* to one direction. A completely different approach, ignoring the inbuilt *Scroll* function and relying instead upon string "slicing", solves both of these problems.

The first requirement is to incorporate the screen image into a string (assuming that the image is not already held in a string, in which case this part will not be necessary).

```
100 DIM Z$(704)
110 LET Q = PEEK 16396 + 256 × PEEK 16397 + 1
120 FOR J = 0 TO 703
130 LET Z$(J + 1) = CHR$ PEEK (Q + J + INT
    (J/32))
140 NEXT J
```

The next step is to print the string and to provide a means of entering the direction of *Scroll* required. The most convenient keys to use are the four cursor arrow keys shifted 5 to 8. The following routine is the one that I find most appropriate:

```
150 PRINT AT 0,0;Z$
160 LET P = 40000
170 IF X > 111 AND X < 116 THEN LET P = 16
180 PAUSE P
181 POKE 16437,255
190 LET X = CODE INKEY$
200 IF X = 0 THEN GOTO 190
```

This routine is intended for use in *Fast* mode. It provides a means of inputting, producing a value for *X* which is dependent upon the key pressed. If you are writing the program from scratch, or have not already attributed a value to *X*, you will need to do so before operating the routine (eg, *Let X = 0*).

The advantage of the above routine is that it enables "continuous" input to be made by simply keeping your finger pressed on a key, yet when you lift your finger off the image becomes rock-steady. There is nothing more annoying than the screen flicker caused by a repeated *Pause 15!*

We now have to introduce two variables, *A* and *B*, dependent upon the value of *X* in order to control the slicing and rearrangement of *Z$*.

```
210 LET A = 33 × (X = 112) + 673 × (X = 113) + 2
    × (X = 114) + 704 × (X = 115)
220 LET B = A − 1
```

Now we can check that *A* and *B* are in range and accordingly slice *Z$*, then repeat the loop:

```
230 IF A > 1 THEN LET Z$ = Z$(A TO) + Z$(TO B)
240 GOTO 150
```

The routine must be operated in *Fast* mode. You will find that it gives a fast *Scroll*, and that the part of the image lost on one side of the screen is displaced to the other side, and the image can be moved "round and round" in this fashion indefinitely. Your program, however, may require that part of the image be *Scrolled* right off the screen. In the case of upward and downward *Scroll* this can be achieved easily as follows:

```
95 DIM Y$(32)
221 LET C = 672 × (A = 673) + 1
222 LET Z$(C TO C + 31) = Y$
```

This works perfectly well for *Scrolling* vertically, but as you will see if you try and *Scroll* laterally, this has the unfortunate effect of slicing off the top of the image. This can be overcome by making line 222 conditional upon the value of *X*, as follows:

```
222 IF X = 112 OR X = 113 THEN LET Z$(C TO C +
    31) = Y$
```

That still leaves the image coming round to the other side when scrolling laterally. The quickest way I have found for dealing with this is:

```
223 IF X < 114 OR X > 115 THEN GOTO 230
224 LET C = 31 × (A = 704)
225 FOR J = 1 TO 673 STEP 32
226 LET Z$(C + J) = " "
227 NEXT J
```

The lateral *Scroll* takes somewhat longer than the vertical *Scroll* but it remains tolerable for most purposes — well under a second. At this point I had better mention a rather important consideration: how to escape from the routine when you have finished *Scrolling*. This can be done by adding the following line:

```
205 IF X = 227 THEN GOTO 300
```

Thus, when you have finished *Scrolling*, simply press *Stop*. Of course, the conditional value of *X* can be changed to any other character code, or several options could be incorporated to direct the program to various lines according to which key is pressed.

Another type of *Scrolling* might also be of interest. This is where you want to display part of a string which is longer than 704 bytes. This is applied most readily to vertical *Scrolling*, and I shall restrict this article to that facility.

First, prepare a string. There are any number of ways of doing this. One such would be improvising upon the first routine described in this article (substituting *Z$* for *X$* in lines 140 and 180 of that routine). A write facility would need to be added, eg:

```
219 INPUT Y$
229 PRINT Y$
```

Of course, you would need to use a different set of line numbers now, but the principle is the same.

When you have prepared a string of some length greater than 704 bytes (preferably in multiples of 32 bytes), you can work on the existing routine described here. Delete lines 100 to 140 and lines 210 onward, then write the following:

```
100 LET A = 1
150 PRINT AT 0,0;Z$(A TO A + 703)
```

Leave lines 160 to 205 intact.

```
210 LET A = A + 32 × (X = 112) − 32 × (X = 113)
220 IF A > LEN Z$ − 703 THEN LET A = LEN Z$ −
    703
230 IF A < 1 THE LET A = 1
240 GOTO 150
```

You will now be able to scroll upwards and down the string, rather like a towel roll. ■

Flying colours!

***Calvin Woodings** presents a colourful barcharts program for the BBC micro*

One of the essential elements in any study of statistics and probability is the display of data Numerous techniques are available, but few can match the barcharts for simplicity and high visual impact They can be impressive enough on the printed page, but they really come into their own when drawn on a colour TV or monitor

Barcharts, or bargraphs as they are sometimes called do not really give any more information than a straightforward table of results No analysis is involved, and their main purpose is to make or reinforce a point by means of an eyecatching display By careful choice of the vertical scale (ie, *Y-axis origin*) the bar separation and the labelling, differences in results can be minimised or exaggerated according to your requirements In fact, in skilled but unscrupulous hands, barcharts can be used to mislead rather than inform

If you are not familiar with barcharts, then some practise with this program is highly recommended (a party political broadcast will never seem the same again)! If you are familiar with them then the program may still be of interest as a demonstration of a use of the BBC's Mode 1 graphics

The program takes in the data and allows you to edit it Up to 30 results can be taken in with labelling and up to 99 without The barchart procedure first asks you for a title to be printed at the top of the display and the *Y-axis origin (Max =)* prompt which appears next gives you the largest number which can be used as the base-line for the chart Use this value if you want to make the differences between the results to appear to be more significant than they really are For realism a value of zero could be entered for most data at this point and intermediate effects can be obtained with intermediate values A large negative value for the *Y-axis* origin will reduce the impact of any differences

Bar separation is asked for next Here a value of zero will mean that the bars are touching, and the maximum value, if used, will mean that the bar will be just a fine vertical line If you do not require special labels at the foot of each bar, reply 'N' to the *'Special X-axis labels* prompt In this case the bars will simply be labelled with numbers starting with 1

If you choose the special labels you will be told how many characters you can use This will depend on the number of results plotted according to the formula *Characters = Int (30/no of results)* In other words with 30 bars you can only have one character per bar but with only 5 bars you can have 6 characters per bar If you have chosen more than 30 results you will get either overlapping numbers as labels or no labels at all depending on your response to the *'Special labels?'* prompt ('N' gives overlapping numbers)

The *Y-axis* label can take up to 8 characters and be certain not to clash with the *Y-axis scale* You would normally put the name of the data in this position The scale has been designed to cope with numbers from 0 000000001 to 9999999999 but numbers with more than 3 significant figures use exponent format

Program notes

The main program resides between lines 50 and 150 and calls the subsequent procedures *Procdataiced* controls the input and editing routines and is set up to restrict the number of results to 99

Procbarchart gets the information needed for screen formatting and calls *Procloval* to advise the user as to the highest value of the *Y-axis* origin It then calls *Procscale* and *Procdraw-graph* which calculate the factors needed to get the data on the screen and draw the chart respectively Line 800 contains @ % = & *307* which selects the general print format with a 7-character field and three digits before exponents are used

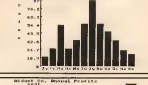
Line 1120 redefines the graphics origin to *250 100* and joins the text and graphics cursors to enable text to be plotted anywhere on the screen Line 1130 draws the *Y-axis* as a double line for clarity Lines 1140 to 1250 contain the loop which draws the coloured triangles which form the bars and also labels them below the *X-axis*

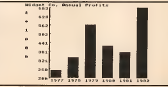
The labelling using the special option is done by line 1180 If only numbers are required then *flag* will be false and lines 1190 and 1200 will print the first and second digit respectively Lines 1260 to 1280 put the scale on the *Y-axis* and lines 1290 to 1330 print the *Y-axis* label in a different colour

If for any reason you should want to use a *Y-axis* label with more than 8 characters, then changing the 100 to 50 in line 1320 will give up to 16 available characters However if the scale uses 7-digit numbers, then the numbers will clash with the letters

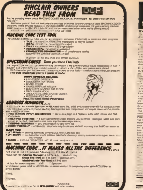
The operation of the other secondary procedures is fairly obvious The function 'input' at line 540 controls the keyboard responses to minimise errors The parameter '*len* restricts the number of characters accepted and *loASC/hiASC* restrict the input to characters with Ascii codes between the values of these two variables

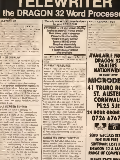
Regular readers of *Popular Computing Weekly* may be able to save some typing if they have already used the *Scotched* program from page 29 of the March 17-23 issue The utility procedures in lines 190 to 860 of that program can be renumbered and used instead of lines 230 to 780 of this one Three minor changes need to be noted Firstly this program has compacted the utilities to save space Secondly the '*3*' in line 460 of the last program has been changed to a '2 to restrict the number of results to 99 for the barcharts Finally some colour changes have been made! ■

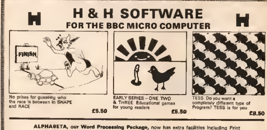




```
10   REM STATISTICS / BARCHARTS
20   REM (C) C.R.WOODINGS / MARCH 1983
30   REM FOR BBC MICRO MODEL B
40
50 ONERRORCLS:PRINTTAB(14,10)"ESCAPE PRESSED?"
   :GOTO100
60 MODE7:PROCtitle:MODE1:DIMlabel$(99)
70 PROCdataload
80 PROCbarchart
90 REPEATUNTILGET
100 @%=10:IF NOT FNyes_no(12,"Another run") THEN 140
110 CLS:PRINTTAB(0,12);:IF FNyes_no(4,"Discard all
    current data") THEN 150
120 PROCreview:GOTO80
130 CLS:RUN
140 MODE7:PROCdouble_height(8,"BYE",132)
150 END
160
170 DEFPROCtitle
180   PROCdouble_height(8,"STATISTICS",132)
190   PROCdouble_height(12,"Barcharts",131)
200   PROCcontinue
210 ENDPROC
220
230 DEFPROCdouble_height(row,words$,colour)
240   column=INT((40-LEN(words$))/2)-2
250   FOR I=row TO row+1:PRINTTAB(column,I);
      CHR$141;CHR$colour;words$
260   NEXT
270 ENDPROC
280
290 DEFFNyes_no(x,A$)
300   LOCAL ans:PRINT:PRINTTAB(x)A$;"  (Y/N) ? ";
310   REPEAT:ans=(GET AND &DF):UNTIL ans=&59 OR
      ans=&4E:PRINTCHR$ans
320 =(CHR$ans="Y")
330
340 DEFPROCcontinue
330   PRINT
360   PRINTTAB(7,23)"Press any key to continue "
      ;:REPEATUNTILGET
370 ENDPROC
380
390 DEFPROCdataload
400   CLS:COLOUR 2:PRINTTAB(14,2)"DATA LOADING:"
410   PRINTTAB(2,4)"Expressions are acceptable:
      End with 00"
420   COLOUR 3:VDU28,0,31,39,6:K=1
430   PRINTTAB(9)"Max. no of results ? ";
440   array=VAL FNinput(2,39,58)
450   DIMdata(array)
460   REPEAT
470   data$="":PRINTTAB(12)"RESULT ";K;" = ";
480   data$=FNinput(10,39,58):PRINT:data(K)=EVAL
      data$:K=K+1
490   IF K>array THEN PRINTTAB(10)"Array full":
      PROCcontinue:K=K-1:GOTO510
500   UNTIL LEFT$(data$,2)="00":K=K-2
510   IF FNyes_no(10,"See and edit") THEN PROCreview
520 ENDPROC
530
540 DEFFNinput(len,loASC,hiASC)
550   LOCAL K%,Z%:K%=0:In$=""
560   REPEAT:Z%=GET
570   IF Z%=127 AND K%>0 THEN K%=K%-1:In$=LEFT$
      (In$,K%):VDUZ%
580   IF Z%>loASC AND K%<len AND Z%<hiASC THEN
      K%=K%+1:In$=In$+CHR$Z%:VDUZ%
590   UNTIL Z%=13 AND K%>0
600 =In$
610
620 DEFPROCreview
630   VDU26:CLS:COLOUR 2:PRINTTAB(14,2)
      "DATA EDITING:"
640   COLOUR 3:VDU28,0,31,39,6:L=0
650   REPEAT:CLS:FOR N=1 TO 10
660   IF N+L=K+1 THEN 690
670   PRINTTAB(12)"RESULT ";N+L;" = ";data(N+L)
680   NEXT
690   IF FNyes_no(10,"Change an entry")
      THEN PROCchange:GOTO690
700   L=L+10:UNTIL N+L-1=K
710   IF FNyes_no(10,"Another look")
      THEN PROCreview
720 ENDPROC
730
740 DEFPROCchange
750   PRINTTAB(12)"Which number ?";:M=VAL
      FNinput(3,47,58):PRINT
760   PRINTTAB(12)"New value ?";:data(M)=EVAL
      FNinput(12,39,58)
770 ENDPROC
780
790 DEFPROCbarchart
800   CLS:VDU26:COLOUR3:@%=&307
810   PRINTTAB(5,12)"Enter the title of the chart.
      ":PRINTTAB(10,14);
820   title$=FNinput(50,31,127):PROClovel
830   CLS:PRINTTAB(6,12)" Y-axis origin:
      (Max=";loval;" ) ?"
840   PRINTTAB(15,14);:minval=VAL FNinput(7,39,70)
850   IF minval>loval THEN 830
860   CLS:PRINTTAB(5,12)"Enter bar separation:
      (Max=";INT(1000/K);")"
870   PRINTTAB(15,14);:sep=INT(VAL
      FNinput(3,39,58))DIV4*4
880   IF sep>1000/K THEN 860
890   PROCscale
900   CLS:flag=0:PRINTTAB(5,12);
910   IF FNyes_no(5,"Special X-axis Labels")
      THEN flag=-1:PROClabels
920   CLS:PRINTTAB(1,12)"Enter Y-axis label.
      (Up to 8 characters)
930   PRINTTAB(15,14);:y_axis$=FNinput(8,31,127)
940   PROCdraw_graph
950   VDU4:VDU31,0,1
960 ENDPROC
970
980 DEFPROCscale
990   maxval=0:FOR N=1 TO K
1000  IF data(N)>maxval THEN maxval=data(N)
1010  NEXT:Yscale=800/(maxval-minval):Xscale=INT(
      (1000/K)DIV4)*4-sep
1020 ENDPROC
1030
1040 DEFPROClovel
1050  loval=1E37
1060  FOR N=1 TO K:IF data(N)<loval
      THEN loval=data(N)
1070  NEXT
1080 ENDPROC
1090
1100 DEFPROCdraw_graph
1110  CLS:PRINT'title$
1120  VDU29,250;100;:VDU5
1130  MOVE-16,0:DRAW-16,800:MOVE-12,800:
      DRAW-12,0:MOVE0,0
1140  X%=0:FOR N=1 TO K
1150  Y%=(data(N)-minval)*Yscale
1160  IF Y%=0 THEN Y%=4
1170  MOVEX%,Y%:PLOT85,X%+Xscale,Y%:MOVEX%,
      0:PLOT85,X%+Xscale,0
1180  IF flag=TRUE THEN MOVEX%,-20:PRINT;
      label$(N):GOTO1210
1190  MOVEX%,-20:PRINT;MID$(STR$(N),1,1)
1200  MOVEX%+16,-50:PRINT;MID$(STR$(N),2,1)
1210  MOVEX%+Xscale+sep,0
1220  X%=X%+Xscale+sep
1230  col=col+1:IF col=4 THEN col=1
1240  GCOL0,col
1250  NEXT
1260  FOR N=0 TO 8
1270  MOVE-250,N*100:PRINTminval+N*
      (maxval-minval)/8;"-"
1280  NEXT
1290  col=col+1:IF col=4 THEN col=1
1300  GCOL0,col
1310  FOR N=1 TO LEN(y_axis$)
1320  MOVE-250,850-N*100:PRINTMID$(y_axis$,N,1)
1330  NEXT
1340 ENDPROC
1350
1360 DEFPROClabels
1370  CLS:chars=INT(30/K):PRINT''
1380  PRINT"Maximum label length =
      ";chars;" characters"''
1390  FOR N=1 TO K:IF chars=0 THEN
      label$(N)="":GOTO1420
1400  PRINTTAB(7)"RESULT ";N;" = ";data
      (N);" Label = ";
1410  label$(N)=FNinput(chars,31,127)
1420  NEXT
1430 ENDPROC
```







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H & H SOFTWARE, Dept. P. 53 Holloway, Runcorn, Cheshire.

A taxing problem . . .

C Voler presents an income tax calculator which checks that you are paying the right amount of tax

This program for the Dragon 32 enables you to determine how much tax you should be paying. All you have to do is enter your gross taxable salary, answer questions about mortgages and shares etc and input the amount of tax paid. The program will then decide whether you paid too much, too little, or the correct amount of tax.

Some tax offices will round down interest received so line 320 could be Bg=Int(Bs/.7) Bt=Int(Bs/7*3). Foreign income deduction could be added to the program by adding

```
212 CLS PRINTA$ PRINT@136 "ARE YOU CLAIMING ANY DEDUCTION FROM INCOME FOR DUTIES PERFORMEDABROAD?
214 PRINT INPUT "ENTER NUMBER OF QUALIFYING DAYS ADJUSTED BY ANY FACTOR ALLOWED BYTAXMAN";QD
216 IFQD<30 GOTO220
218 G1=G1-(GT AL)*QD/1460
```

Notes

Line(s)

30 and 40 Place page headings in strings for easy recall

50–160 Decide your personal allowance (PA) according to marital status and age

170 Inputs your Gross Salary (GT) less any superannuation contributions to retirement benefit schemes which will normally be deducted by your employer

180 Calculates your initial Gross taxable salary (G1)

200 Inputs any allowances (AL) or expenses agreed by the taxman such as replacement of special clothing and or tools, certain fees you must pay to carry on your profession, any travelling or other expenses necessary in the course of your duties.

210 Updates G1 since all permitted allowances are deductable

240 The full amount of interest paid on your only or main home mortgage (up to £25 000) can be claimed against tax (IN)

250 G1 is updated to G2

270 Inputs net interest received from sources where standard rate tax has already been deducted, such as a Building Society (BS)

280 and 290 Inputs other sources of income where tax has not been deducted and may now be subject to tax (PE) (BA)

300 Updates G2 in G3

310 If your allowances exceed your income, then G3 could be negative at this point, and obviously you have no taxable income

320 Calculates the Building society Interest Gross (BG) and also the amount of tax already deducted (BT) which is not reclaimable

330 3840 is the amount of tax on 12 800 at the standard rate of 30%. Since standard rate tax has already been allowed on BG (equal to BT) then the maximum amount of tax permitted at standard rate is 3840-BT. Or put another way, G3+BG (G4) should not exceed 12,800 to remain in the standard rate tax bracket.

340 Therefore calculates and prints tax due (TX) for standard rate tax payers

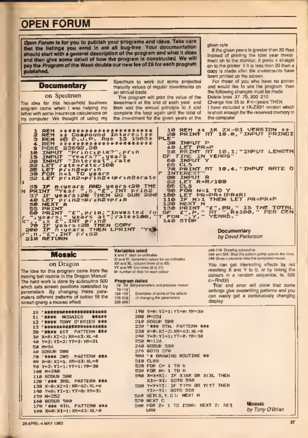
350-390 Calculate TX for higher rate payers

400 Prints the total TX already calculated, and demonstrates the PRINT USING facility of neatly lining-up and rounding-off the columns to 2 decimal places

410 Asks how much tax has been paid (see your P60) (TP)

420–440 Print out the result as required

```
10 REM**WRITTEN BY C.C.VOLLER**
20 REM*******25/2/1983*********
30 A$="**INCOME TAX CALCULATOR 82/83**"
40 B$="YOU SHOULD HAVE PAID TAX AT
50 CLS:PRINTA$:PRINT@128,"ARE YOU 65 OR OVER IN THIS TAX  YEAR?"
60 PRINT:PRINT"ENTER 1 FOR YES"
70 INPUT"ENTER 2 FOR NO";AG
80 IFAG=1ORAG=2GOTO90ELSE50
90 CLS:PRINTA$:PRINT@128,"ARE YOU CLAIMING AS A SINGLE    OR MARRIED PERSON?"
100 PRINT:PRINT"ENTER 1 FOR SINGLE"
110 INPUT"ENTER 2 FOR MARRIED";MS
120 IFMS=1ORMS=2GOTO130ELSE90
130 IFAG=1ANDMS=1THENPA=2070
140 IFAG=1ANDMS=2THENPA=3295
150 IFAG=2ANDMS=1THENPA=1565
160 IFAG=2ANDMS=2THENPA=2445
170 CLS:PRINTA$:PRINT@128,"GROSS TAXABLE SALARY=";:INPUTGT
180 G1=GT-PA
190 CLS:PRINTA$:PRINT@128,"ARE YOU CLAIMING ANY ALLOWANCES?"
200 INPUT"IF SO ENTER THEM NOW              OR PRESS enter ";AL
210 G1=G1-AL
220 CLS:PRINTA$:PRINT@128,"DO YOU HAVE A MORTGAGE?"
230 PRINT:PRINT"ENTER INTEREST PAID ON THE LOAN THIS YEAR"
240 INPUT"OR PRESS enter ";IN
250 G2=G1-IN
260 CLS:PRINTA$:PRINT@96,"DO YOU HAVE ANY INCOME?"
270 PRINT:INPUT"ENTER INTEREST FROM BUILDING    SOCIETY";BS
280 PRINT:INPUT"ENTER ANY PENSION NOT ALREADY   TAXED";PE
290 PRINT:INPUT"ENTER ANY INTEREST FROM BANK,   SHARE DIVIDEND, ETC";BA
300 G3=G2+PE+BA
310 IFG3<=0THEN CLS:PRINTA$:PRINT@128,"YOU HAVE NO TAX TO PAY!":GOTO450
320 BG=BS/.7:BT=.3*BG
330 T3=3840-BT:G4=G3+BG
340 IFG4<12801THENTX=(.3*G3):CLS:PRINT@64,B$,"30%=",:PRINTUSING"#####.##";TX
350 IFG4>12800ANDG4<15101THENTX=T3+(.4*(G4-12800)):CLS:PRINT@64,B$,"30%=",:PRINT
USING"#####.##";T3:PRINT"40%=",:PRINTUSING"#####.##";.4*(G4-12800)
360 IFG4>15100ANDG4<19101THENTX=T3+920+(.45*(G4-15100)):CLS:PRINT@64,B$,"30%=",:
PRINTUSING"#####.##";T3:PRINT"40%=","920.00","45%=",:PRINTUSING"#####.##";.45*
(G4-15100)
370 IFG4>19100ANDG4<25301THENTX=T3+2720+(.5*(G4-19100)):CLS:PRINT@64,B$,"30%=",:
PRINTUSING"#####.##";T3:PRINT"40%=","920.00","45%=","1800.00","50%=",:PRINTUS
ING"#####.##";.5*(G4-19100)
380 IFG4>25300ANDG4<31501THENTX=T3+5820+.55*(G4-25300):CLS:PRINT@32,B$,"30%=",:P
RINTUSING"#####.##";T3:PRINT"40%=","920.00","45%=","1800.00","50%=","3100.00
","55%=",:PRINTUSING"#####.##";.55*(G4-25300)
390 IFG4>31500THENTX=T3+9230+.6*(G4-31500):CLS:PRINTB$:PRINT@32,"30%=",:PRINTUSI
NG"#####.##";T3:PRINT"40%=","920.00","45%=","1800.00","50%=","3100.00","55%=
","3410.00","60%=",:PRINTUSING"#####.##";.6*(G4-31500)
400 PRINT"TOTAL=",:PRINTUSING"#####.##";TX
410 PRINT@288,"ENTER THE AMOUNT OF TAX PAID",:INPUTTP
420 IFTX=TP THENPRINT@352,"YOUR TAX IS CORRECT"
430 IFTX>TP THENPRINT@352,"YOU HAVE TO PAY TAX=";:PRINTUSING"####.##";(TX-TP)
440 IFTP>TX THENPRINT@352,"YOU HAVE A TAX REFUND=";:PRINTUSING"####.##";(TP-TX)
450 PRINT@416,"IF YOU WANT ANOTHER ASSESSMENT  PRESS enter OTHERWISE break"
460 A$=INKEY$:IFA$<>CHR$(13)GOTO460ELSERUN
```



Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Documentary

on Spectrum

The idea for this household business program came when I was helping my father with some insurance calculations on my computer. We thought of using my Spectrum to work out some projected maturity values of regular investments on an annual basis.

The program will print the value of the investment at the end of each year and then add the annual principle to it and complete the loop again until the total of the investment for the given years at the given rate.

If the given years is greater than 20 then instead of printing the total year investment on to the monitor, it prints it straight on to the printer. If it is less than 20 then a copy is made after the investments have been printed on the screen.

For those of you who have no printer and would like to use the program then the following changes must be made:
Delete lines 37 70, 200 210
Change line 35 to If n<years THEN
I have included a 1K-ZX81 version which is short enough for the reserved memory in the computer.

```
  1 REM **********************
  2 REM ** Compound Interest**
  3 REM *© O.J.P. Age 13 1983*
  4 REM **********************
  5 POKE 23692,20
 10 INPUT "Principle?";prin
 15 INPUT "Years?",years
 20 INPUT "Interest",rate
 22 LET rate=rate/100
 25 LET prin2=prin
 30 FOR n=1 TO years
 32 LET prin2=prin2+(prin2*rate
)
 35 IF n<years AND years<20 THE
N PRINT "Year ",n,"£",INT prin2
 37 IF years>20 THEN GO SUB 200
 40 LET prin2=prin2+prin
 50 NEXT n
 55 PRINT
 60 PRINT "£",prin;"Invested fo
r ",years;" years at";rate*100,"
%",,"is £",INT prin2
 70 IF years<20 THEN COPY
200 IF n<years THEN LPRINT "Yea
r",n,"£",INT prin2
210 RETURN
```

```
 10 REM ** 1K ZX-81 VERSION **
 20 PRINT AT 10.0,"INPUT PRINCI
PLE"
 30 INPUT P
 40 LET PR=P
 50 PRINT AT 10,1;"INPUT LENGTH
 OF TIME IN YEARS"
 60 INPUT Y
 65 CLS
 70 PRINT AT 10,4,"INPUT RATE O
F INTEREST"
 80 INPUT R
 82 LET R=R/100
 85 CLS
 90 FOR N=1 TO Y
100 LET PR=PR+(PR*R)
110 IF N>1 THEN LET PR=PR+P
120 NEXT N
130 PRINT "£",PR," IS THE TOTAL
 OF  £",P," AT ",R*100," PER CEN
T FOR ",Y," YEARS."
140 STOP
```

Documentary
by David Parkinson

Mosaic

on Dragon

The idea for this program came from the moving ball routine in the Dragon Manual. The hard work is done by subroutine 500 which sets screen positions controlled by parameters. By changing these parameters different patterns of colour fill the screen giving a mosaic effect.

Variables used
X and Y start co-ordinates
XI and YI increment values for co-ordinates
XR and XL column limits (0 to 63)
YT and YB line limits (0 to 31)
M number of dots for each colour

Program notes
20 60 Set parameters and produce mosaic
70-110, 120-130, 170 210, 220-260 Examples of some of the effects of changing the parameters
500-570 Drawing subroutine
540 and 550 Stop the pattern going outside the limits
580 Gives a pause to view the completed mosaic

You can get interesting effects by not resetting X and Y to 0, or by taking the colours in a random sequence, ie, 520 c=*Rnd*(8)

Trial and error will show that some settings give overwriting patterns and you can easily get a continuously changing display.

```
10 '*********************@****
11 '**** MOSAICS     @****
12 '**** TONY O'BRIEN ***
13 '*********@*********@**
20 '@*** 1ST  PATTERN @**
30 X=0:XI=2:XR=63:XL=0
40 Y=2:YI=2:YT=3:YB=31
50 M=56
60 GOSUB 500
70 '**** 2ND  PATTERN @**
80 X=0:XI=1:XR=63:XL=0
90 Y=2:YI=1:YT=1:YB=30
100 M=240
110 GOSUB 500
120 '*** 3RD. PATTERN ***
130 X=0:XI=1:XR=62:XL=0
140 Y=0:YI=1:YT=0:YB=31
150 M=252
160 GOSUB 500
170 '*** 4TH. PATTERN ***
180 X=0:XI=1:XR=63:XL=0
190 Y=0:YI=1:YT=0:YB=30
200 M=251
210 GOSUB 500
220 '*** 5TH. PATTERN ***
230 X=0:XI=2:XR=63:XL=0
240 Y=0:YI=1:YT=0:YB=30
250 M=126
260 GOSUB 500
270 GOTO 270
500 '* DRAWING ROUTINE **
510 CLS%
520 FOR C= 1 TO 8
530 FOR N= 1 TO M
540 X=X+XI: IF X>XR OR X<XL THEN
    XI=-XI: GOTO 540
550 Y=Y+YI: IF Y>YB OR Y<YT THEN
    YI=-YI: GOTO 550
560 SET(X,Y,C): NEXT N
570 NEXT C
580 FOR Z= 1 TO 1500: NEXT Z: RET
URN
```

Mosaic
by Tony O'Brian

Astsroids

on Vic20

This is the fairly common arcade game of Asteroids. You are in the middle of an asteroid storm with only a laser cannon to help you. To make matters worse an alien saucer appears and acts as a kamikaze pilot. You have three lives you lose one every time an asteroid or alien hits you. The controls are displayed on running the program.

```
1 REM*****ASTEROIDS****
2 REM***BY C I.DUNCAN**
4 GOSUB4000 GOSUB1050 POKE36869,255
5 S=0 LI=3 POKE36879 33 PRINT"J"
10 SC=7680 CO=38726 CL=38920 RB=7580
15 DIMA(7) D(7)
16 Y=11 X=10 D=1 SX=0 SY=0
20 A=8
25 FORI=0TO7 R(I)=7680+INT(RND(1)*506) D(I)=INT(RND(1)
   *3+21) IFRND(1)>.5THEND(I)=-D(I)
30 NEXT
35 POKECL+Y*22+X,0 POKESC+Y*22+X,190
36 IFRS>0THENPOKERS,32
40 RD=INT(RND(1)*3+21) IFRND(1)>.5THENRD=-RD
45 AS=INT(RND(1)*506)+7680
50 FORI=0TO7 K=PEEK(197) IFABS(SX)+ABS(SY)=0THENPOKE
   36877 0 GOTO55
51 POKE36879 2 POKE36877 235 GOTO55
55 D=D+(K=34)-(K=33) IFD<0THEND=D+4
56 PRINT "SCORE=" S
60 IFD>3THEND=D-4
65 SX=SX+((D=1)-(D=3))*(K=36) SY=SY+((D=2)-(D=0))*(K=36)
70 IFSX<-1THENSX=-1
75 IFSX>1THENSX=1
80 IFSY<-1THENSY=-1
85 IFSY>1THENSY=1
90 POKESC+Y*22+X,32 X=X+SX Y=Y+SY
95 IFK=15THENX=INT(RND(1)*32) Y=INT(RND(1)*23)
100 IFX<0THENX=21
105 IFX>21THENX=0
110 IFY<0THENY=22
115 IFY>22THENY=0
116 IFPEEK(SC+Y*22+X)<>32THEN1000
120 POKECL+Y*22+X,3 C=190 IFD=2THENC=150
125 IFD=3THENC=188
126 IFD=0THENC=2
135 POKESC+Y*22+X,C
140 IFA(I)=0THEN200
141 IFA(I)=SC+Y*22+XTHEN1000
145 POKEA(I) 32 A(I)=A(I)+D(I)
150 IFA(I)<7680THENA(I)=A(I)+506
155 IFA(I)>8185THENA(I)=A(I)-506
160 POKEA(I)+CO 2 POKEA(I),0
200 IFK<>32ORINT(I/2)*2=ITHEN260
201 POKE36878 12 FORK1=255TO230STEP-1 POKE36877,K1 NEXT
205 X1=X Y1=Y DX=(D=3)-(D=1) DY=(D=0)-(D=2) C=192 IFDY<>0
    THENC=221
210 X1=X1+DX Y1=Y1+DY
215 POKECL+Y1*22+X1,5 IFPEEK(SC+Y1*22+X1)=32THEN240
216 POKE36878,15 POKE36877,190
220 POKESC+Y1*22+X1,3
225 FORJ=0TO7 IFA(J)=SC+Y1*22+X1THENA=A-1 R(J)=0 S=S+20
230 NEXTJ
231 IFSC+Y1*22+X1=ASTHENS=S+100 AS=0
232 POKE36877,0
235 GOTO250
240 POKESC+Y1*22+X1,C IFX1<21ANDX1>0ANDY1<22ANDY1>0THEN
    210
250 X2=X Y2=Y
251 X2=X2+DX Y2=Y2+DY POKESC+Y2*22+X2,32
255 IFX2<>X1ORY2<>Y1THEN251
256 POKE36877 0
260 IFAS=0THEN260
265 POKEAS 32 IFRND(1)>.5THENAD=INT(RND(1)*3+21) IFRND
    (1)>.5THENAD=-AD
267 AS=AS+AD IFPEEK(AS+AD*2)>40THENAD=-AD
270 IFAS<7680THENAS=AS+506
275 IFAS>8185THENAS=AS-506
280 POKEAS+CO 6 POKEAS 1
285 IFAS=SC+Y*22+XTHEN1000
300 NEXTI IFA=0THEN20
305 IFAS=0ANDRND(1)>.9THEN40
310 GOTO50
1000 PRINT"SCORE"S
1005 FORI=1TO2000 NEXT LI=LI-1 IFLI>0THENPRINT"J" GOTO10
1010 POKE198,0
1030 END
1050 FORI=7168TO7168+400-1 READD POKEI,D NEXTI FORI=7424
     TO7431 POKEI 0 NEXTI
1060 FORI=7168+400TO7168+500-1 READD POKEI,D NEXT
1070 DATA56,126 255 126 254 240 60 0
1080 DATA0 66,126,171,126,60,0,0
1090 DATA24 36 60,66 66,66 66,66
1095 DATA24 0 75 64,118,92 28 06
2600 DATA0 126,66,66,66,66,66 126
2610 DATA0 8,24,8,8,8 8 8
2620 DATA0 126,2,2,126 64,66,126
2060 DATA0 126 2 2 126 2 2 126
2050 DATA0 66 66 66,126,2 2,2
2080 DATA0,126 64 64 126,2,2,126
2670 DATA0 126 66 66,126,66,66,126
2080 DATA0 126 2 2 2 2,2 2
2050 DATA0 126 66 66 126,66,66,126
2080 DATA0 126,66 66,126,2,2 2
2610 RETURN
4000 POKE36879,26
4010 PRINT "****ASTEROIDS********"
4020 PRINT "BY C I DUNCAN"
4030 PRINT "THE OBJECT OF THIS GAME IS TO SHOOT AS
     MANY
4040 PRINT"DRIFTING ASTEROIDS AS POSSIBLE ALSO YOU MUST
     KILL THE ALIEN SHIP."
4050 PRINT"AS AN ADDED DIFFICULTY YOU WILL LOOSE A LIFE
     IF AN ALIEN OR ",
4060 PRINT"ASTEROID CRASHES IN TO YOU,YOU HAVE THREE
     LIVES."
4070 PRINT"CONTROLS Z-TURNS YOU LEFT C-TURNS YOU RIGHT
     ",
4080 PRINT" M-TURNS IN YOUR THRUSTS."
4090 PRINT "HIT A KEY"
5000 GETA$ IFA$=[illegible]THEN5000
5010 RETURN
```

Asteroids
by C Duncan

Double seve

on ZX81

Certain programs demand and then process data. Thus a program to work out the telephone bill, or keep a mark book or keep a club members record would use this kind of program.

They are usually fairly long, and contain valuable information. The best way to run the program is to get it to *Save* itself after entering data each time along with the program variables. This is easy to do (see page 110 of the Sinclair handbook). What is more difficult is to get the program to *Save* itself more than once without it trying to repeatedly *Save* itself every time it is re-*Load*-ed from the tape. That is precisely what my program achieves.

The point of it, of course, is to safeguard your valuable program and its valuable information against the vagaries of the ZX81 *Save*.

Program notes

First, the low byte of *Ramtop* is *Poke*-ed with the value 1. This value is not *Save*-ed when the program *Saves* itself. Therefore, if you are *Saveing* a program, the program goes on to *Save* itself again. On switch-on at another time, the low byte of *Ramtop* will be set to 0 (of course, you will have to watch out if you *Poke Ramtop* before *Loading*, eg, to *Load* a machine-code program first). Therefore after *Loading* once, the program will *Goto* line 1. If necessary the program may be *Saveed* any number of times by repeating lines 1020 and 1030. Also, to further guard against mis-*Saveing* a line at 1040 (and at 1125) to *Pause* will allow you to *Save* on a second (and third, etc) cassette.

```
1000 POKE 16388,1
1010 CLS
1020 SAVE "[illegible]"
1030 IF PEEK 16388=0 THEN GOTO 1
1100 SAVE "[illegible]"
1110 IF PEEK 16388=0 THEN GOTO 1
1120 POKE 16388,0
1130 PRINT "SAVED"
```

Double Sava
by A Thornton

Plot a picture

on Lynx

This is a drawing game for the Lynx. Although simple it is a lot of fun.

The line begins at the top left corner of the border and will be white unless you change the colour. There are eight different colours which can be used including black which will delete lines already made if wished.

0 = Black or delete
1 = Blue
2 = Red
3 = Magenta
4 = Green
5 = Cyan
6 = Yellow
7 = White

There are different keys to send your line in different directions. If you go outside the border the line will bounce back.

W = North	E = North-East
D = East	C = South-East
X = South	Z = South-West
A = West	Q = North-West

Each key press moves the lines three pixels.

```
100 REM *** PLOT A PICTURE ***
110 REM *** JOANNA GREENWOOD ***
120 PAPER 0
130 INK 7
140 CLS
150 PLOT 0,5,5
160 PLOT 2,250,5
170 PLOT 2,250,242
180 PLOT 2,5,242
190 PLOT 2,5,5
200 LET Q=6
210 LET W=6
220 PLOT 0,Q,W
230 IF GET$="W" THEN GOTO 320
240 IF GET$="X" THEN GOTO 350
250 IF GET$="A" THEN GOTO 380
260 IF GET$="D" THEN GOTO 410
270 IF GET$="Q" THEN GOTO 440
280 IF GET$="E" THEN GOTO 480
290 IF GET$="Z" THEN GOTO 520
300 IF GET$="C" THEN GOTO 560
310 ELSE GOTO 600
320 LET W=W-3
330 PAUSE 3000
340 GOTO 680
350 LET W=W+3
360 PAUSE 2500
370 GOTO 680
380 LET Q=Q-3
390 PAUSE 2500
400 GOTO 680
410 LET Q=Q+3
420 PAUSE 2000
430 GOTO 680
440 LET Q=Q-3
450 LET W=W-3
460 PAUSE 2000
470 GOTO 680
480 LET Q=Q+3
490 LET W=W-3
500 PAUSE 1500
510 GOTO 680
520 LET Q=Q-3
530 LET W=W+3
540 PAUSE 1000
550 GOTO 680
560 LET LET Q=Q+3
570 LET W=W+3
580 PAUSE 500
590 GOTO 680
600 IF GET$="0" THEN INK 0
610 IF GET$="1" THEN INK 1
620 IF GET$="2" THEN INK 2
630 IF GET$="3" THEN INK 3
640 IF GET$="4" THEN INK 4
650 IF GET$="5" THEN INK 5
660 IF GET$="6" THEN INK 6
670 IF GET$="7" THEN INK 7
680 PLOT 2,Q,W
690 GOTO 230
```

Plot a picture
by Joanna Greenwood

Snail race

on Spectrum

This program simulates a race between six snails. When run you are asked how much you want to bet and then on which snail.

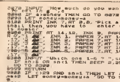
If you win your money is increased and the program goes back to be the start.

Program notes

5-30	Graphics data
1000-1050	Race start and move snails
1060-2000	Checks if a snail has run
8000-8060	Draws the bookies
8065-9300	Inputs for snail money
9000-9006	Checks if your snail has won
9997-9985	No money left routine

```
  1 PAPER 0: CLS : BORDER 2: IN
K 0
  5 FOR n=0 TO 7: READ a: POKE
USR "c"+n,a: NEXT n
 10 FOR n=0 TO 7: READ a: POKE
USR "a"+n,a: NEXT n
 20 FOR m=0 TO 7: READ a: POKE
USR "b"+m,a: NEXT m
 30 DATA 24,56,28,58,88,24,48,1
02,0,18,26,64,111,188,255,127,0,
17,138,206,100,238,254,254
 40 LET money=100
 50 PAUSE 200: CLS : IF money<=
0 THEN GO TO 9997: PRINT "You ha
ve £";money
 60 INPUT ;" Do you want to se
e the snails race (w) or go t
o the bookies (b) ";a$
 70 IF a$="w" THEN GO TO 1000
 75 PLOT 0,119: DRAW 255,0
 80 PRINT PAPER 3; INK 8;AT 3,1
4;[redacted]": FOR n=0 TO 30: P
RINT INK 1;AT 0,n;"*": BEEP .05
,n: BEEP .001,n: NEXT n: GO SUB
8000
1000 PAPER 7: CLS
1010 LET c=2: LET d=2: LET e=2:
LET f=2: LET g=2: LET h=2
1020 LET ko=1: FOR n=3 TO 18 STE
P 3: PRINT AT n,0;ko: LET ko=ko+
1: NEXT n
1030 FOR n=142 TO 16 STEP -24: P
LOT 0,n: BEEP .01,n-60: DRAW 255
,0: NEXT n
1035 FOR n=0 TO 200: NEXT n: BEE
P .01,20: BEEP .01,30: BEEP .01,
17: BEEP .1,21: PRINT AT 0,12;"T
here off"
1041 PRINT AT 3,c; INK 0;"*";
INK 1;AT 6,d;"*"; INK 2;AT 9,e
;"*"; INK 3;AT 12,f;"*"; INK
4;AT 15,g;"*"; INK 5;AT 18,h;
"*"
1050 LET c=c+RND*1: LET d=d+RND*
1: LET e=e+RND*1: LET f=f+RND*1:
 LET g=g+RND*1: LET h=h+RND*1: B
EEP .001,20
1060 IF c>29 THEN GO TO 9000
1070 IF d>29 THEN GO TO 9010
1080 IF e>29 THEN GO TO 9020
1090 IF f>29 THEN GO TO 9030
1100 IF g>29 THEN GO TO 9040
1110 IF h>29 THEN GO TO 9050
2000 GO TO 1040
7000 STOP
8000 PAPER 1: CLS : BORDER 5: IN
K 7: PRINT PAPER 3;AT 5,13;"BOOK
IES"
8005 INK 4: FOR n=20 TO 0 STEP -
1: PLOT 0,n: DRAW 255,0: NEXT n
8010 INK 7: PLOT 90,140: DRAW 80
,0: DRAW 0,-20: PLOT 90,120: DRA
W -0,20: PLOT 90,120: DRAW 80,0
8020 PLOT 90,120: DRAW -0,-100:
PLOT 170,120: DRAW -0,-100: PLOT
 90,20: DRAW 80,0: PLOT 90,70: D
RAW 80,0
8030 CIRCLE 130,95,12: CIRCLE 12
4,100,2: CIRCLE 137,100,2
8040 PLOT 131,90: DRAW -8,-3: PL
OT 126,90: DRAW 9,0
8050 PLOT 125,85: DRAW -10,-14:
PLOT 135,85: DRAW 10,-14
8060 INK 9: FOR a=20 TO 70: PLOT
 86,a: BEEP .001,a-20: DRAW 87,0
: NEXT a
8065 PRINT INK 6;AT 0,0;"You hav
e ";money;" pounds"
```

Continued over the page



```
8070 INPUT "How much do you want
 to bet in $ ",a
8080 IF a>money THEN GO TO 8070
8090 LET money=money-a
8100 PRINT INK 7,AT 0,0,"Pick a
snail then you have to  enter i
ts number"
8200 PRINT AT 14,12, INK 0, PAPE
R 7,"1 ", INK 1, PAPER 7,AT 14
,17,"2 ", INK 2, PAPER 7,AT 15
,12,"3 ", INK 3, PAPER 7,AT 16
,17,"4 ", INK 4, PAPER 7 AT 18
,12,"5 ", INK 5, PAPER 7,AT 18
,17," 5 "
8300 INPUT "Which one 1-6 ? ",sn
  IF sn>6 OR sn<1 THEN BEEP 2,20
, GO TO 8300
8999 RETURN
9000 IF c>29 AND sn=1 THEN LET a
=a*2  LET money=money+a  GO TO 5
0
9010 IF d>29 AND sn=2 THEN LET a
=a*3  LET money=money+a  GO TO 5
0
```

```
9020 IF e>29 AND sn=3 THEN LET a
=a*3  LET money=money+a  CLS   G
O TO 50
9030 IF f>29 AND sn=4 THEN LET a
=a*4  LET money=money+a  GO TO 5
0
9040 IF g>29 AND sn=5 THEN LET a
=a*5  LET money=money+a  GO TO 5
0
9050 IF h>29 AND sn=6 THEN LET a
=a*5  LET money=money+a  GO TO 5
0
9060 FOR n=0 TO 400  GO TO 50
9997 PAPER 3  CLS  PRINT INK 0.
"You have run out of money !!!!"
;
9998 FOR n=0 TO 30  BEEP .1,n  N
EXT n  BEEP .01,n  BEEP 1,00  ST
OP
```

Snail race
by David Aklam

3-D

on Dragon

A pleasing graphic effect is created by this program

Variables
A B Co-ords of squares, rectangles and circles
C D Co-ords of squares and rectangles
Q Random colour of line

Program notes
Lines 10-70 Create rectangular display
Lines 80-140 Create square display
Lines 150-190 Create circular display

By changing the *Pmode* number in line 10 (to 4 for example), and changing the second *Screen* number in line 10 (to 1), other interesting effects may be obtained

```
1 REM *##PATTERN PROGRAM*$*
10 PMODE 3,1:PCLS:SCREEN 1,0
20 A=0 B=0:C=255:D=192
30 Q=RND(4)
40 COLOR Q,Q
50 LINE(A,B)-(C,D),PSET,B
60 A=A+1:B=B+1:C=C-1:D=D-1
70 IF B=192 THEN 80
75 GOTO30
80 A=120 B=96:C=129:D=97
90 Q=RND(4)
100 COLOR Q,Q
110 LINE(A,B)-(C,D),PSET,B
120 A=A-1:B=B-1:C=C+1:D=D+1
130 IF B=0 THEN 150
140 GOTO 90
150 A=120:B=96:C=1
160 Q=RND(4)
170 CIRCLE(A,B),C,Q
180 C=C+1
185 IF C=80 THEN 20
190 GOTO 160
```

3-D
by David Williams

Graph

on Spectrum

This program for the Spectrum may be used to draw a smooth curve through a set of points plotted on the screen

Program notes
10 Inputs n the number of points to be initially plotted
20 to 60 Inputs pixel coordinates and plots corresponding points
100 to 220 Computes and draws a smooth graph passing through the points plotted in the previous section

The running time for the program is roughly proportional to n^2 So you are going to have to be very patient if n is more than about 6

Readers may be interested in the principle behind lines 100 to 220 It is well known that a straight line can be drawn to pass through two given points If n=2 then the program will produce this straight line There is an extension of this idea that is not so obvious

If you have three points, then the graph of an expression of the form

$$ax^2+bx+c$$

could be drawn to pass through your three points For four points one would need an expression of the form

$$ax^3+bx^2+cx+d$$

For five points a term with x to the power four would have to be included Calculating a, b, c, etc, would be very laborious but there is a way round that Try a dry run with n=3, say to see how the program works

```
 10 INPUT "How many points?",n
 20 DIM x(n): DIM y(n)
 30 FOR p=1 TO n
 40 INPUT "Coordinates";x(p),y(
p)
 50 PLOT x(p),y(p)
 60 NEXT p
100 FOR x=0 TO 255
110 LET y=0
120 FOR r=1 TO n
130 LET a=1  LET b=1
140 FOR i=1 TO n
150 IF i=r THEN GO TO 180
160 LET a=a*(x-x(i))
170 LET b=b*(x(r)-x(i))
180 NEXT i
190 LET y=y+y(r)*a/b
200 NEXT r
210 IF y>=0 AND y<=175 THEN PLO
T x,y
220 NEXT x
```

Graph
by John Huttall

Deathtrap

on Vic20

This game in 3.5K, utilises both colour and sound and is played with the joystick although information for conversion to keys is included.

To play the game, you have to move around the grid collecting the diamonds, while avoiding trapping yourself. There is a time limit which is displayed with your score. During the game, Vic plays music.

When the music stops, an alien drops down one of the columns and if it hits you, a life is lost.

After clearing the grid, the bonus stage appears. Here you press the fire button so that the alien reaches the diamond for a bonus!

You have three lives and an extra one at 5,000.

Program notes

10-90 Title and variables
100-150 Set up screen
160-200 Decode joystick
210-250 Move
260-310 All checks
340-610 Bonus stage
620-660 End of game
690-700 Out of time
710-810 Move alien and change tune
820-850 Extra life
860-930 Grid draw
940 Music data

For keys

Change the following
70 IF (197)=60 THEN 70
160 U1=PEEK (197):X=0
170IF U1=57 THEN X=22
180 IF U1=64 THEN X=1
190 IF U1=21 THEN X=-1
200 IF U1=13 THEN X=-22
430 IF PEEK (197)>0 THEN 480

Where it says press fire — hit a key

```
10 POKE828,0:POKE829,0
20 SC=0:LL=0:QQ=0:CS=0:Z=0:S1=36878:V=S1+2
30 HS=PEEK(829)+256*PEEK(828)
40 PRINT"MARTIN AYUB PRESENTS"
50 PRINT"DEATHTRAP!"
60 PRINT"PRESS 'FIRE' TO START!":POKE37139
   ,0:POKE37154 127
70 IF(PEEK(37137)AND32)>0THEN70
80 DIMM%(35),N%(35):FORI=1TO27:READM%(I),N%(I)
   :NEXT:D=1:L=28
90 POKEV+1,14:PRINT"":POKEV,15:DL=15
100 GOSUB860:C=0:D=1
110 FORII=1TODL
120 X=7725+460*RND(1):IFPEEK(X)=32ORPEEK(X)=90
    THEN120
130 POKEX,90:POKEX+30720,6*RND(1)+1:NEXT
140 BP=7702:RC=112
150 POKEBP,65:TI$="000000"
160 U1=PEEK(37137):U2=PEEK(37152):X=0
170 IF(U1AND8)=0THENX=22
180 IF(U2AND128)=0THENX=1
190 IF(U1AND16)=0THENX=-1
200 IF(U1AND4)=0THENX=-22
210 BP=BP+X:IFPEEK(BP)=32THENBP=BP-X:GOTO260
220 IFBP<7701ORBP>8185THENBP=BP-X:GOTO260
230 POKEBP-X,RC:RC=PEEK(BP):POKEBP,65
240 IFRC=90THENSC=SC+1:RC=32:FORI=220TO225:POKES
    1-1,I:NEXT:POKES1-1,0
250 IFSC=DLTHEN340
260 C=C+1:IFC=INT(N%(D)/5)THENPOKES1,0:GOTO320
270 PRINT"SCORE ="SC+CS;TAB(13)"TIME ="RIGHT$
    (STR$(60-2*(DL-15)-VAL(TI$)),2)
280 IF(CS+SC)>=5000ANDQQ=0THENGOSUB820
290 IFTI>3600-120*(DL-15)THEN690
300 IFA$<>TI$THENPOKES1+1,220:POKES1+1,0:A$=TI$
310 GOTO160
320 D=D+1:IFD=LTHEN710
330 POKES1,M%(D):C=0:GOTO160
340 POKES1,0
350 FORI=0TO6:POKEV+1,29:FORW=0TO300:NEXT:POKEV+
    1,14:FORW=0TO300:NEXT:NEXT
360 FORI=0TO8:FORJ=220+3*ITO220+4*I:POKES1,J:NEXT
    :NEXT:POKES1,0
370 FORI=0TO22:PRINT" ":POKE218,150:NEXT:CS=
    CS+(3000-120*(DL-15))-60*VAL(A$)
380 PRINT"BONUS STAGE":Z=0
390 FORW=0TO2000:NEXT:GOSUB860
400 POKE8164+3*INT(7*RND(1)),90
410 FORI=7702TO7723STEP3:CR=PEEK(I):POKEI,42:
    POKES1,200:POKES1,0
420 FORJ=0TO5
430 IF(PEEK(37137)AND32)=0THEN480
440 NEXT
450 POKEI,CR:NEXT
460 Z=Z+1:IFZ=10THENI=I-3:GOTO480
470 GOTO410
480 Y=22:AL=I
490 AL=AL+Y:POKEAL-Y,CR:CR=PEEK(AL):POKEAL,42
500 IFCR=93THENY=22:GOTO570
510 IFCR=115ANDY=22THENY=-1:GOTO570
520 IFCR=115ANDY=1THENY=22:GOTO570
530 IFCR=107ANDY=22THENY=1:GOTO570
540 IFCR=107ANDY=-1THENY=22:GOTO570
550 IFCR=113ORCR=125ORCR=109THEN580
560 IFCR=90THEN590
570 POKES1,240:FORW=0TO10:NEXT:POKES1,0:GOTO490
580 FORI=250TO140STEP-1:POKES1,1:NEXT:POKES1,0:
    GOTO610
590 FORI=15TO0STEP-1:POKEV,1:FORJ=220TO240:POKES1
    ,J:NEXT:NEXT:POKES1,0:POKEV,15
600 CS=CS+100
610 DL=DL+2:FORI=0TO43:PRINT:NEXT:CS=CS+DL:SC=0:
    GOTO100
620 FORZZ=0TO10:FORXX=230-8*ZZTO240-8*ZZ:POKES1,
    XX:NEXT:NEXT:POKES1,0
630 CS=CS+SC:LL=LL+1:IFLL=3THEN650
640 SC=0:PRINT"":GOTO100
650 PRINT"G-A-M-E O-V-E-R"
660 IFCS>HSTHENHS=CS:POKE828,INT(CS/256):POKE829,
    CS-256*INT(CS/256)
670 PRINT"HIGHEST ="HS
680 FORW=0TO3000:NEXT:RUN20
690 FORI=7702TO7723:POKEI,32:NEXT:PRINT"O-U-T
    O-F T-I-M-E!"
700 GOTO620
710 POKES1,0:CR=32:FORI=7702TO7702+2*INT(8*RND(1))
720 IFCR=65THEN620
730 POKEI-1,CR:CR=PEEK(I):POKEI,42:POKES1,220:
    POKES1,240:NEXT:POKES1,0
740 POKEI-1,CR:POKES1,240:FORJ=I+21TO8202STEP22
750 POKEJ-22,CR:CR=PEEK(J):POKEJ,42
760 IFCR=65THEN620
770 POKES1,PEEK(S1)-1
780 NEXT:IFL=28THENL=32:GOTO800
790 IFL=32THENRESTORE:L=28
800 D=1:POKES1,0
810 FORI=1TOL-1:READM%(I),N%(I):NEXT:GOTO330
820 PRINT" E-X-T-R-A L-I-F-E ":LL=LL-1:QQ=1
830 FORI=1TO5:POKEV,I*3:FORJ=140+3*ITO170+10*I
    :POKES1,J:NEXT:NEXT
840 FORJ=240TO140STEP-1:POKES1,J:POKES1+1,J:NEXT:
    POKES1,0:POKES1+1,0
850 RETURN
860 A$="┌┬┬┬┬┬┬┬┬┬┐"
870 PRINT"";A$
880 FORI=7724TO8180STEP22:FORJ=0TO22STEP3:POKEI+J,
    93:NEXT:NEXT
890 D$=""
900 POKE8185,125
910 PRINTD$"└┴┴┴┴┴┴┴┴┴┘"
920 FORI=3TO20:PRINTLEFT$(D$,I)TAB(3*INT(7*RND(1)
    ))"├──┤":NEXT
930 RETURN
940 DATA0,9,210,14,212,14,215,14,212,14,210,13,
    212,14,215,24
950 DATA201,14,195,14,195,14,201,14,201,35,195,14,
    201,14,210,14,195,9,201,14,213,14,195
960 DATA8,201,14,210,14
970 DATA195,14,195,14,195,9,195,9,187,17
980 DATA195,10,195,10,207,10,207,10,210,10,210,
    10,215,10,215,10
990 DATA195,10,195,10,207,10,207,10,201,10,201,
    10,175,10,175,10
1000 DATA195,10,195,10,207,10,207,10,210,10,210,
    10,215,10,215,10
1010 DATA215,10,215,10,219,10,223,10,225,10,195,
    10,195,10
```

Deathtrap
by M Ayub

Interest

on ZX81

This program calculates how much money is gained by putting money in a bank for a certain number of years (1) at simple interest and (2) at compound interest. The program prints both of these so that you can see how much extra is gained by compound interest in that many years.

The program can be modified for the Vic20 by changing line 20 to *Print* "[clear screen]. The program runs inside the 1K of the ZX81 and all the results are printed out on the screen. The variable used in the program are P — the Principal, T — the number of years, R — the rate of interest, B — the simple interest final amount, and A — the compound interest final amount.

Depreciation

This program calculates how many years it takes for an item depreciating at a certain rate per annum, to be worthless. It can be modified to work on a Vic20 by removing line 110, and changing line 20 to *Print* "[clear screen]. The variables used are S — the Sum of money, P — the % depreciation, I — the number of years and A — a calculating variable.

```
10 REM DEPPECIATION
20 CLS
30 PRINT"SUM OF MONEY="
40 INPUTS
50 LETA=S
60 PRINT"PER-CENT DEPRECIATION IN DECIMALFORM="
70 INPUTP
80 LETI=1
90 LETA=A-P*A
100 PRINT"I=";I,"A=";A
110 SCROLL
120 IFA<.05THENGOTO150
130 LETI=I+1
140 IFA>0THENGOTO90
130 PPRINT
160 P+INT
170 PRINT"ORIGINAL SUM";S
180 PRINT
190 PRINT
200 PRINT"RATE OF DEPRECIATION=";P
210 PRINT
220 PRINT
230 PRINT"YEARS FOR SUM TO REACH ZERO=";I
240 END
```

```
10 REM SIMPLE/COMPOUND INTEREST
20 CLS
30 PRINT"PRINCIPAL="
40 INPUTP
50 PPINT"TIME="
60 INPUTT
70 PPINT"RATE="
80 INPUTR
90 PRINT"SIMPLE INTEREST"
100 PRINT"P","R","T","AMOUNT"
110 LETI=(P*R*T)/100
120 LETB=P+I
130 PRINTP,R,T,B
140 LETA=INT(P*((1+R/100)^T))
150 PRINT"COMPOUND INTEREST"
160 PRINT"P","R","T","AMOUNT"
170 PRINTP,R,T,A
200 PRINT"--------------------------------"
210 END
```

Interest/Depreciation

by M Valentine

Adventure Competition!

Win a Commodore 64!

Write an adventure game and win one of the great prizes *Popular Computing Weekly* is offering in its Adventure Competition starting next week. The star prize is a Commodore 64 for the best adventure game written for any home micro, plus a second prize of a Vic20 and for the next ten runners-up two Commodore adventure games of their choice.

All you have to do to enter is collect any three of the four coupons that will appear in *Popular Computing Weekly* each week during May and send them in together with your entry and name and address, by 30 June, the closing date for this competition. Full details and rules for entry will appear in next week's issue. So don't forget to start collecting the coupons and good adventuring!

Cruising & Blind Alley

£10 to be won

Can you beat the new high score?

Cruising

First there was *Space Invaders*, then there was *Pacman* — now there is *Cruising*. This all action, machine code, arcade type game will test your powers of co-ordination to the limit. Never before has a game asked you to think so quickly, or move so fast.

Achieving a high score on *Cruising* takes considerable skill and not a little patience.

Popular Computing Weekly is offering £10 each month to the player with the highest score on *Cruising*. All you have to do to enter this month's competition is send a print-out of your highest score, together with your name and address to:

Popular Computing Weekly
Cruising
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the *Cruising* challenge?

The highest score sent in so far this month is 8722 from Adrian Hales of Camberley, Surrey. If you have a higher score you could still win this month's £10 — but hurry, entries close on April 30.

Notes

1) Each entry must consist of a ZX printout and your name and address.
2) Closing date for this month's *Cruising* challenge entries is April 30.
3) The highest score each month will receive £10.
4) High scores cannot be transferred from one month to another.
5) The judges' decision is final.
6) No employees of Sunshine Publications Ltd or their families will be eligible to enter.

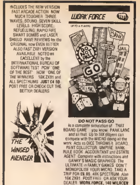
Blind Alley

Blind Alley is a game of strategy. In order to win you must outwit the computer, using your craft to fence in and finally destroy the enemy pursuit vehicles. But watch out for the solid trail left by your opponents — one touch is fatal!

Each month *Popular Computing Weekly* is giving away £10 to the player with the highest score on *Blind Alley*. To enter this month's competition simply send in a copy of your score and the code at the bottom of the score table, together with your name and address to:

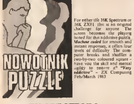
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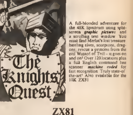
The highest score sent in so far is 6680 from Alex Blox of Newbury, Berks. Entries for this month's competition close on May 31.





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ZX SPECTRUM

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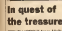
ZX81

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In quest of the tressure

THE HOBBIT from Melbourne House, is a vast sprawling program — actually more of an experience than a program! Once having solved the fundamental puzzle there is still a lot of fun to be had in exploring this wonderful environment

The reason that I have mentioned *The Hobbit* is to lead into a dicussion of a fairly recent program from Phipps Associates, *The Knight's Quest* Written by Mike Farley, this is, like *The Hobbit* for the 48K Spectrum And the similarity does not end there

The on-screen display of *The Knight's Quest* is much the same as that of *The Hobbit*, being split into two sections The upper-screen is devoted to a graphic representation of the Adventurer's current location, while the lower screen contains the text, commands and so on (the boring paraphernalia) I have to admit here that the graphics in *The Knight's Quest* cannot really be compared favourably with those of *The Hobbit* but they do give a serviceable account of the scene

The original version of *The Knight's Quest* only supported black and white graphics I rather missed the colour and assumed that memory restrictions had precluded its use However, a new version has appeared on the market with full colour graphics And they certainly help in creating the mood!

This adventure takes the traditional form of a Quest You the adventurer are placed before the Castle Camelot. Your task is to find the lost treasure of Merlin The rest is up to you!

You have to find the treasure, find the place to return it and decide which objects to pick up, which to ignore and how to use the ones you take with you — and believe me each one could have a purpose!

Now, while *The Hobbit* allowed many different ways of solving the puzzles *The Knight's Quest* is really more to my liking For each location there is only one way to unravel the conundrum at that point — so there is only one way to kill the dragon for example, and it is up to the intrepid traveller to find it He will in the end, although it may well take a lot of hard thought and experimentation before the solution is arrived at!

As you can see, then *The Knight's Quest* is much more of a puzzle than *The Hobbit*, although that program too had its fair share of brainteasers *The Knight's Quest* would certainly have a strong appeal to the traditionalist Trevor Toms, a partner in Phipps Associates tells me that he is an ardent adventure fan himself, so the whole project has obviously been handled with loving care

There are one or two details that could be better — for example, response times are rather slow, particularly if you are used to *The Hobbit* which is very fast On the whole though I can recommend this to anyone suffering from withdrawal symptoms after finishing *The Hobbit*.

● Get, Take, Pick Early on in most adventures, you will get to a location and the computer will tell you 'I See a Sword' How do you get it (if you want it)?

There are a couple of traditional words to use in this circumstance, and these are *Get* sword, or *Take* sword You can also try *Pick*, which some programs recognise — these are the most common, and will probably not even be mentioned in the documentation, should you be lucky enough to get any The computer will inform you very quickly if it doesn't know the word you are trying to use

Many programs will allow you to type "*T*" or "*G*", which has the same effect as *Take* or *Get* If several articles are lying about you will need to be more specific ■

This series of articles is designed for novice and experienced Adventurers alike Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter So if you have an Adventure you want reviewed or if you are stuck in an Adventure and cannot progress any further, write to Tony Bridge Adventure Corner, *Popular Computing Weekly* Hobhouse Court 19 Whitcomb Street London WC2 7HF.

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JUSTIFIED CRITICISM

avid Lee of Solihull Birm ngham, writes

Q I have been told that all Spectrums being sup- lied to schools must have a deo output for use with a onitor, and that most Spec- ums in schools do have one. I nderstand that it is quite diffi- ult to adapt a normal Spec- um for monitor use, so could ou tell me if there is any way at I could buy one of these hool models for use on a onitor at home?

A What you have been told is not quite right It is not e Spectrum that has been lapted but the monitor The onitor supplied will now ork with the Spectrum but it ll not work with anything se

It is one of the 'quirks' of e micros in schools projects at whichever computer you y under the scheme, it must used with a monitor, cost- g about £350 That is the ice of two more 48K Spec- ums

It is not surprising that the heme has come in for some stified criticism, given that ost schools already have col- r television sets and so do t really need an extra dis- ay Also, I wonder how veral hundred pupils are ing to get the critical 'hands ' experience when the hool is only allowed to buy e micro regardless of cost lls for more flexibility in the heme, allowing more, eaper machines in school, so ore people can learn to use em have so far been nored

If you really do want a onitor then I can only sug st that you contact Griffin & eorge of Fredrick Street, rmingham, who are educa- onal distributors for the Spectrum However I should seriously consider the wisdom of spending £350 on a dedi cated monitor for a computer that is half the price

WILL IT RUN?

R G Anderson of Cornwall Road, Walsall West Midlands, writes

Q I have an Oric 1 Advertisements for the machine state that many Centronics printers can be used with it. I also have a new Seikosha GP 80D printer, which was designed to run with a Sharp MZ80K I have heard that the GP 80D, though it has a Centronics interface, will not Run with my Oric Could you please confirm this?

Also, if the GP 80D cannot be used, do you know if there is an interface available for use with my Oric?

A The GP 80D is a version of the GP 80A, which has been specially adapted for the Sharp It should be all right to try it on your Oric

However, if you look at the code numbers of the characters on your MZ80K you will see that the letters are not Ascii standard unlike those on the Oric As the MZ80K stores its letters between 01 and 26 (decimal) when you press the letter *A* on the Oric, it will not return the code 01 it will return the Ascii code 65 Code 65 on the MZ80K is a graphic character of a spade which is what will appear on the screen if you press *A* on your Oric

COLOUR PRORLEM

G Dennis of Custance Walk York writes

Q In the February 17-23 issue, you carry a letter from Mr Holmes of Huddersfield, who has a problem with colours on his Spectrum. I have a domestic Hitachi 22" and I am pleased with it, when used with my Spectrum. In my 'den' I have a 14' Hitachi colour set that does not work with my Spectrum — I am not pleased. I have tried two 'fine tuning programs' from books, and have got some very washed out colours

I would like to know about this tiny screw I have a second issue pcb and what I find are two variable capacitors and two variable resistors in a line Removal of the pcb permits direct examination under the capacitors and resistors, but still no tiny screw

A This is partly my fault as I obviously did not make myself clear earlier It is in fact these capacitors and resistors that need trimming I described it as a small screw, because that is all that could be seen of it on the issue 1 pcb — if you look underneath the Oric, you will see what I mean

If you do take the top off your computer, then you will see two very small brass screws on top of the capacitors but of course you can see the rest of the capacitor as well

The resistors could never be accessed from outside, so they give extra opportunities for trimming Again, I must stress that great care is needed when doing this — it is unfortunately all too easy to trim the signal right off the screen

MAIL ORDERS!

Michael Atkins of Margate 4275 South Africa writes

Q As a computer enthusiast, I am constantly frustrated by the limited (and expensive) range of software and books in South Africa Consequently, I try to buy my supplies from England Would it be possible for you to find out the cost of posting a cassette, and an average-sized book, to South Africa, as I am always uncertain as to how much I should add with my order?

A The only reason I can see you wanting to buy your software from Britain is because of the wide range available here I cannot see that it is going to be much cheaper

At the moment a cassette in a small jiffy (padded) bag will cost 30p surface mail, and 82p air mail Books are harder to judge but the 180 pages of *Forth Programming* by Steven Vickers will cost 80p surface, and £2 36 air mail when packed into an ordinary envelope

Assuming that you do not want to wait months for a book or cassette, I would suggest that you allow £1 for a cassette and £2 50 for a book Postal charges rose recently, so you might still find yourself a little short

In most cases it would be better to write to the company first and ask how much they charge Also it might well pay to read advertisements carefully Some companies at least do not charge extra regardless of where the book or cassette is going

With an increasing amount of software going abroad companies may find it useful to help potential overseas customers by stating their international rates on their advertisements

STICK IT OUT!

Paul Asplin of Kenton Road, Harrow, Middlesex writes

Q I am 14 years old and have just started computer studies at school Here we are learning Pascal on our five Commodore Pets; at home I have a Vic20. I wondered whether or not there was a Pascal cartridge available for the Vic. I find it rather confusing trying to learn Pascal at school, and Basic on my computer at home

Nigel O'Sullivan of New Cross Road, London SE14 **wants to know if there is a flight simulator available for the Vic20.**

A I am going to have to disappoint you both I was not surprised to find no Pascal for the Vic and can appreciate your reasons for wanting it However, if you can stick it out, two languages will be better than one

As for a flight simulator I had assumed one was available for the Vic, but now that I come to look for one — nothing If anyone knows of a flight simulator available for the Vic we should like to know of it I presume that it would need at least 8K

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can The address is *Peek & Poke, PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

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ORIGINAL SPECTRUM cassette for sale or swap including Hobbit, Pimania, Draks, Orbiter, Arcadia + many more. Tel 0825 2614 evenings.

ZX SPECTRUM 16K, 4 months old + £250-worth of software + books £140. Luton (0582) 37854 (evenings).

SPECTRUM 48K printer + 3 rolls, boxed, unused, leads, manuals, £180. 061 824 5168 (anytime).

48K SPECTRUM + ZX Printer + 5 rolls of paper and over £60-worth of books and games, also many magazines, will accept £220. Tel 0767 74083 evenings.

ZX SPECTRUM 16K, still in box, all leads and manuals, 2 games and books, £125 ono. Tel 366 0989.

SPECTRUM 16K, boxed and complete £100 ono. Mr Smith, Tel Bristol 298848 (5 pm).

16K SPECTRUM, 3 months old £100. Tel 0385 831538.

16K SPECTRUM, 3 weeks old, issue 2 machine with leads, manuals etc., perfect condition + Planetoids, Hungry Horace, full guarantee, £110 ono. Quick sale needed. 4 Beechcroft Court, Leigh Road, Highbury, London N5 1HA.

48K SPECTRUM, 4 months old + £100-worth of software + books £180. Tel 081 862 1834.

SPECTRUM TAPE containing games I have mastered or completed. Games include The Hobbit, Penetrator, Horace games and Orbiter, Prince £7. Tel 0582 890812 ask for Neil (after 5 pm or at weekends).

SPECTRUM, 16K, leads, books, carrying case £140 ono. Tel Hemel Hempstead 47063 (6 pm).

SPECTRUM 48K + recorder £180 ono. Tel 01 727 8866 (Harry).

SPECTRUM TAPES for sale: 3D Tunnel £4.50 + Ground Attack £4.50. Tel Truro 2650.

SPECTRUM 48K + ZX printer + 8 rolls of paper + books + software worth £400, sell for £240. Tel 0865 711550.

ZX81s for sale

ZX81 GAMES 3D Defender, Microgen Chess, Q.S. Scramble, all for £6. Tel Winchester 521/67 evenings.

ZX81 WITH 16K RAM Filesixty keyboard and manuals with a selection of cassettes, still boxed and guaranteed £70 ono. Tel Accrington, Lancs 392787 after 6 pm.

ZX81 16K plus £45-worth of software £65. Tel Pemendau 583818 evenings.

ZX81 1K 6 months old £35 ono. Tel 0532 583471.

16K ZX81 + DKTronics keyboard + £70 of software including Flight Simulation, Defender etc. + 2 books, all leads + power supply included £110 ono. Tel 386 0839 (after 6 pm).

16K ZX81 fitted with DKTronics graphic Rom, books, keyboard, Zonx sound pack, lots of books and magazines, tons of software, all fitted in a Council case £210. Tel 01-568 8117 evenings.

ZX81 16K RAM + unused printer + books + leads £65. Tel 01 370 4620.

ZX81 16K + £110 of software, leads + manual, good condition, Sant Rem £70 ono. Tel 050-270 339.

ZX81 16K + Fuller keyboard, £30 of books, £60 of tapes, offers please. Tel 051-481 2800 daytime.

ZX81 16K, video inverter, 10 games, 6 books, lots of magazines and programs worth over £180, will sell for £110 ono. Tel Southend (0702) 517808.

ZX81 16K RAM Fuller keyboard, over £100 of software, £75 of books + magazines £100 ono. 01-398 3802 (London W3).

ZX81 + Memotech 16K Rem pack, leads, manual, original, and lots of software and books, sell for £65 ono or swap in part exchange for ZX Computer. Tel 0407 63127.

ZX81 with 16K, all leads + manual £45.50. Tel Medway (0634) 736.

ZX81 16K 4K graphics Rom + user definable graphics, Fuller keyboard, all in plastic case, £75 of software £100. Tel 01 460 2761.

ZX81 16K manuals, leads, tapes, books £56 ono. Watford 0923 38213.

SINCLAIR ZX81 16K, Memotek High Resolution graphics, 25 software cassettes, 6 books, manuals, leads etc. £95. Tel 450 2395.

ZX81 16K with 10 bought cassettes and 13 self programmed tapes, very good condition £85. Telephone Cambridge (0223) 871338 after 4 pm.

ZX81 16K, DKTronics Graphics Rom, Maplin keyboard, printer + £70 of software, £195 ono. Tel Fleet 5329.

16K ZX81 with full-size Fuller keyboard and ZX81 sound + 21 purchased games including 3-D Defender, Scramble, Chess + A Compiler + 8 ZX magazines + 2 books, new £230, sell £115. Tel Beckham 52368 after 7.30 pm.

ZX81 1K, Fuller keyboard + 4K graphic Rom + manuals £470. Tel 262 3716 after 5 pm.

ZX81, 3 months old + JRF 16K Rem pack + manual, leads, tapes and magazines £56. Tel King's Lynn 672114.

ZX81 DK Tronics keyboard, numeric pad, 16K, 4K Graphics Rom, joysticks/interface, £60 of software, £115 ono. Tel High Wycombe 713889 (6 pm).

ZX81 16K software, boxed, guaranteed until November £65 ono. Tel 0703 333873.

ZX81 16K under 2 months old brand new compatible cassette recorder games books and magazines £95 Tel Lee Valley 713030 ext 327 (during working hours)
ZX81 + 16K Ram pack, £56 ono Tel 01 505 1784

Dragons for sale

DRAGON 32 with eight months guarantee with two joysticks two books leads one cartridge and three games tapes £200 Tel 0603 409534 (anytime)
DRAGON 32 For sale on cassette Flight Simulators Scarfman, Graphic Animator games tape ODTZ, Dragon Mountain Calixo Island only £5.50 each A C Durrant Flat C111 James Baillie Flats Leeds
DRAGON owner wishes to swap or sell cassettes or cartridges Tel 0225 742777 evenings Mark.
DRAGON 32 with joysticks boxes, £120 worth of software £200 Tel 0273 552211 (anytime)
DRAGON 32K + 10 cassette software including Telewriter Donkey King etc £260 Tel Steve Ping 0784 34300 ext 806
DRAGON 32, £170 and joysticks Maternal software boxes Tel Oundle 72048
DRAGON 32 Talked cassette player Tandy joysticks, several cassettes London delivery possible £165 Tel Southend (0702) 337336
DRAGON 32, six months old joysticks books cassette recorder £150 worth of software worth £380 will accept £280 Tel Huddersfield 38502
SWAP DRAGON 32 still under guarantee £174 of software including light pen + all latest software For BBC Model A or B Tel 01-484 9225 (after 6 pm)
DRAGON 32 as new boxed with full documentation Upgrading so for quick lead £130 Tel Bromley 01-462 3681

Tandys for sale

32k COLOUR TANDY joystick case CCR tape recorder software + hardware + books etc cost over £870 three months old accept £450 ono Tel 061-370 2162
VIDEO GENIE 48K, two discs double density engines green screen music synthesizer + extensive software £750 Tel Day 0623 37733 evening and weekends 0623 21120
TRS 80 MODEL 1 LEVEL 2 16K with Tandy tape recorder + £100 of software including word processing + books £170 Tel Derby 868570 evenings and weekends
TANDY POCKET COMPUTER with interface + software + books altogether worth £100 Accept £40 Tel 341 4004 after 4 pm
TANDY TRS 80 LEVEL 2 MODEL I 16K + monitor cassette books + software £450 Tel 0602 283679

Commodores for sale

VIC20 + cassette £150 Tel Willesden 459 5047
VIC20 C2N cassette unit, software machine code cartridge Super expander joystick + programmers reference guide £180 ono Tel 01-868 5475
VIC20 + cassette recorder + 2 games cartridges + 3K and 16K Ram + joystick + well over £1,000 of cassette software value approximately £1,400 giving away at £450 Tel Ruislip (08956) 38564 Joel
VIC20, cassette deck 8K mother board Super expander joystick, £60 of software and books selling for £260 Tel 01 304 8148
VIC20 with cassette deck 8K Ram 3K Super expander 10 cartridges including 5 Scott Adams joystick, £200 worth of software original price £1,335 selling for £550 or £600 with a TV Tel 01-367 6751
VIC20 8K RAM will swap for fourth cartridge or sell for £28 Sell programming 6502 for £5 or swap game Tel Welley Rocks 550 546
VIC20 JELLY MONSTERS CARTRIDGE, new unwanted gift £10 360 0633 after 5 pm
VIC20 with C2N cassette deck mint condition boxed 10 months old £120 Tel 0480 72170 (evenings)
SWAP VIC20 + cassette deck + Blitz Frogger and Domino for BBC Model A. Tel 061 941 2553
STACK STORE BOARD + 16K + Vic Kit 2 + Vic Force Tel 01 977 0782 after 5 pm
VIC20 + free joystick and dust cover £117 16K Ram pack £30 3K Ram pack, £15 only 3 months old still boxed will sell for £185 complete Phone 01-460 7840 (Bromley)
16K RAM PACK for Vic20 £30 Tel Leeds 675514
VIC20 SOFTWARE FOR SALE, bargain prices books Ram packs cassettes and cartridges including programmers aid Hi Res graphics etc other utilities Tel 01-574 0614 (after 4.30)
VIC20 3K SUPER EXPANDER almost new £23 Tel 01-574 4122
VIC20 ADVENTURE CARTRIDGES, Adventureland The Count Mission Impossible £12.50 each Also 3K Ram pack £12 (selling only) Tel 061-368 8805 after 6 pm
VIC20 + C2N cassette fully boxed, 16K Ram 5 months old Programmers Aid cartridge Introduction to Basic 1 and 2 £40 of software books £225 ono CTV £50 ono Tel Bolton 389 153.
VIC20 8K RAM £20 Gortek + micro chips £8 Introduction to Basic Part 1 £9 Wanted Super expander 01-650 7347
SPECIAL VIC20 8K internal memory + 8K expansion high resolution Rom machine code manual C2N tape books joysticks software including Backgammon Adventureland cost over £420 accept £225 ono Tel 061 431 3553
SWAP, WANTED OMEGA RACE CARTRIDGE for my Gorf cartridge also any other non-Commodore cartridge for my Avenger or Mole Attack or Star Battle or Sargon Chess cartridges Tel Deeside 815277
VIC20 SOFTWARE to swap or sell including Laser Zone Grid Runner Tomb of Drun Cat Vic Rescue Myryds Tel 031-661 7477 after 5 pm
VIC20 16K + 3K cassette recorder joystick Introduction to Basic 1 and 2 Pacman cartridge Mastermind + 8 tape £65 of software value £380 sell for £235 Tel Llanelli 0554 820581
COMMODORE PET 2001 in built monitor + 2 cassettes + all books + Commodore Computing £188 Tel Chalfont St Giles 2436 02407
MOLE ATTACK for Super Slot for the Vic20 Tel Northampton (0604) 881674 after 5 pm ask for Gary
VIC20 + 16K cassette deck £100 of software 4 cartridges Super expander 3K Gorf Adventure Myriad lots of tapes software and magazines cost over £400 new sell for £275 ono Tel Chester 338050
VIC20 + Super expander guarantee + software etc £130 offers accepted Tel 01-800 0517 (evenings)
COUNT TO SWAP for Pirate Cove or Mission Impossible Tomb of Drewan for other 16K adventure + super expander for cards games cartridge. Tel Wokingham 785696 (6 pm)
VIC20, 16K tape deck Jelly Monster £50 of software joystick, book £220 or swap for Spectrum + software Tel Bury St Edmunds 702257 (5 pm)
VIC20 software swap for any Scott Adams adventures or other adventures Tel 025-6713445
VIC20 original cassettes most popular games by Rabbit Romik Llamasoft and Bugbyte prices £3-£4 each Tel 01 574 4122 (after 6 pm)
VIC20 CARTRIDGE Adventureland will swap for any other Scott Adams adventure in cart series Tel 021 3538163

Ataris for sale

ATARI VCS + cartridges including Soccer Tennis Space Invaders + Basic Program + extra keyboards + paddles £130 Tel 641 0226
ATARI VCS in good condition + eight cartridges including Starmaster Space Invaders £130 ono Tel 341 4884 after 4 pm
VCS, paddles joysticks seven cartridges Space Invaders Berzerk, Androids Missile Command £125 ono Tel Dundee (0382) 78554 (6 pm)
SWAP SCOTT ADAMS MYSTERY FUN HOUSE for any other or Atari 800
ATARI GAMES CENTRE, £100 ono Or part exchange for ZX81 with 16K. Tel 950 1584
ATARI 800 BASIC CARTRIDGE, program recorder joystick chess cartridge + manual very good condition under guarantee £200 Tel 01 863 3420
ATARI 400 32K 410 program recorder Basic joystick manuals + software including Star Raiders under guarantee £440 Tel 01-769 1401
ATARI 800 48K + disc drive + cassette + games cartridges including Missile Command and Star Raiders £600 Tel Southend 0702 614061
ATARI 400 32K + 410 tape deck Basic tech hardware system manual original boxes Crush Crumble Chomp Air Strike introduction to program leaving country £485 ono Tel Burghfield (073529) 3373
ATARI VCS CARTRIDGE Space Jockey new in UK, £10 Burghfield 3373
ATARI 400 software Submarine Commander cartridge £20 Tel Burghfield 3373
ATARI VCS + 11 cartridges including Pacman and Defender cost £330 Sell for £180 Tel 0242 850570
ATARI VCS almost new + cartridges including Pacman + Space Invaders £120 ono Tel 01-800 1574 (after 7 pm weekdays)
ATARI VCS + 5 cartridges will swap for any computer or sell Tel 025-671 3445
ATARI VCS boxed, as new 5 cartridges. Offers? Tel 01-848 0630 (any time)
ATARI VCS KEYBOARD, + 33 cartridges including Star Raiders Atlantis Pitfall Raiders ET Frogger worth £850+ accept £350 ono Tel 0478-822605 (office hours)
ATARI VCS with 2 cartridges, as new £25 Tel 01-878 8936 (Richmond)
ATARI VCS with joysticks paddles and 9 cartridges including Superman Asteroids Chess and Missile Command very good condition £280 new sell for £140 first come first served Tel 01 858 0485
ATARI 400, 48K, with Basic and tape deck £240 Tel Southend-on-Sea (0702) 559455 after 5 pm

Acorns for sale

FOR SALE BBC Model A 32K £522 with £500 value software for quick sale Offers to 01-858 3701 (after 6 pm)
ACORN ATOM, 12K Ram + 16 Rom including floating point Rom + utility Rom 3 books lots of software £175 ono Tel Stanford-le-Hope 6409
PET CBM 3008 but 32K (has been upgraded) + cassette unit, cassettes and books £240 Tel 01-680 7495
ACORN ATOM 12K Ram 12K Rom floating point leads manual software includes Invaders Breakout Chess 3D Maze £160 Tel Rowrah 736258 (after 5 pm)
ACORN ATOM 12K Ram 12K Rom word processing Rom same software all leads + manuals VIA interface £110 ono Tel 01 448 5515

For sale

SOFTWARE FOR DRAGON 32 various titles including Pacman Mansion Adventure £6 each Tel Mike (Bedford) 0234 42024
TI99/4A including recorder leads and Munchman cartridge any offers. Tel Byfleet 42760
SWAP VIC CARTRIDGE, Savio Castle for Pirate Cove or Mission Impossible Tel Chris 0685 247636
L STONE TAPE RECORDER with three pin socket + counter suitable for Oric 1 £28 Tel 445 5385 after 7 pm
VIC20 cassette deck audio 8K Ram pack, high resolution graphics pack, joystick, four games cartridges + lot of software £450 will sell for £245 Tel Nottingham 292682.
INTELLIVISION VOICE BOX B17 cartridge, Tron Subhunt, D+D Pitfall, and four others. £200 Tel. Ascot 21160
VIDEO GENIE, + software £140 Tel 0383 736243
EIGHT VIC CARTRIDGES FOR SALE either £130 the lot or sell individually Tel Ruislip 38564
16K SPECTRUM SOFTWARE worth £50 sell for £30 including Arcadia, Chess 3D Tunnel Gulpman Orbiter Phone 0372 52267 after 4 pm
DATABASE VIDEO GAME + three cartridges £75 ono Tel Letchworth 74405
FOR SALE SINCLAIR SPECTRUM PROGRAMS 16K and 48K various bsell Tel 361 9092
SEIKOSHA GP80 PRINTER, Syntronics Pet interfaces £125 Tel 09327 86762
LEMONADE STALL AND MELODY MAKER for the 16K and 48K Spectrum Both games are one tape for £2 Send money now for tape and our salelist Send to N A McGlynn c/o Oggysoft, 38 Abden Avenue Kinghorn KY3 9TE
SWAP FOR SUPER EXPANDER + any other cartridge or sell our tapes including Balloon Race Race Arcadia Rainbow Passage Pet Shot, Amok Blitz Alien Blitz Cosmic Battle Cosmiad Space Storm + Character set for £50 ono Tel 061-487 1244 ask for Gavin

Wanted

EPSOM MX80ST printer + 1,000 sheets paper £120 Tel 01-470 3673 (eves after 6 pm or w/ends)
LEMONADE STALL. Buy and sell with help of advertisements Generator Avoid walls and three before delivering the bomb Any Spectrum Both games on one tape for £2 Send to N A. McGlynn 38 Abden Ave Kinghorn KY3 9TE for immediate return
SPECTRUM GAMES FOR SALE, s.a.e for details All games have been made up by myself N A. McGlynn 38 Abden Ave Kinghorn KY3 9TE
VIC20 tape recorder brand new £30 Tel 804 4780
SHARP PC1211 with manuals + cassette interface as new £46 Tel N Rogers 0742 344427 (daytime) 698758 (evening)

NEW RELEASES

BULLS EYE!

Shadow Software has come up with a version of Darts for the Dragon 32 The program called *Championship Darts*, is for two players

A large dartboard is displayed on the screen and you aim by moving a cursor over it You can choose the length of game you wish to play

Program *Championship Darts*
Price *£5 95*
Micro *Dragon 32*
Supplier *Shadow Software*
8 Hallgate
Thrunscoe
Nr Rotherham
South Yorkshire
S63 0TU

STOP, LOOK . . .

Hopper from Discount Software is the first tape in a range of arcade style games for the Jupiter Ace

The Ace has done badly in the software stakes a pity since running the high speed Forth should be well suited to fast action games

There are no prizes for guessing that in *Hopper* the idea is to get your frog across a busy 8-lane motorway

You will need a memory add-on since the game requires 19K

Program *Hopper*
Price *£5 00*
Micro *Jupiter Ace*
Supplier *Discount Software*
25 Plymouth Rd
Springfield
Chelmsford
Essex

ADVENTURING

Established software houses usually play very safe by issuing versions of arcade favourites like *Space Invaders* when a new micro is issued

However, Bug Byte has made an adventure game, *The Castle* its first release for the Oric

A traditional text style game, *The Castle* features all the usual comments — Inventory, Look, Examine — and the tape contains versions for both the 16 and 48K machines

Program *The Castle*
Price *£8 00*
Micro *Oric 16/48K*
Supplier *Bug Byte*
98-100 The Albany
Old Hall St
Liverpool LE 9EP

STAR BASE

A new program from Quicksilva proves that at least one major company regards the ZX81 as far from dead

Black Star features 3D graphics, 8 instrument displays, and 17 levels of difficulty Your task is to pilot your way through various defences to destroy the *Black Star* base

You have four targets to aim for and a high score table is there to record your successes

Program *Black Star*
Price *£4 95*
Micro *ZX81*
Supplier *Quicksilva*
Palmerston Park House
13 Palmerston Rd
Southampton SO1 1LL

SHIP AHOY!

Galleons is a version of the game *Battleships* which most of us have played using pen and paper

Here you can play against the computer and try to guess where it has positioned its fleet In turn it will try to destroy your ships, so careful thought is required to win

Program *Galleons*
Price *£5 00*
Micro *Dragon 32*
Supplier *Wizard Software*
PO Box 23
Dunfermline
Fife KY11 5RW

PILOT ERROR

Skyhawk is an original game for the Vic20 from Quicksilva As pilot of the *Skyhawk* you have to defend your village from attack by raiders

The game features 3D graphics and a scrolling landscape As the game progresses, the number of attacking aircraft increases and they become more difficult to shoot down

A fuel gauge warns you when you are getting low and have to refuel An added feature enables you to save the high score table

The program requires an expanded 3K or 8K Vic with a joystick

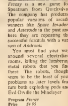
Program *Skyhawk*
Price *£7 95*
Micro *Vic20 + 3K or 8K plus Joystick*
Supplier *Quicksilva*
Palmerston Park House
13 Palmerston Rd
Southampton SO1 1LL

METAL MICKY

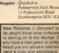


Frenzy is a new game for Spectrum from Quicksilva The company has produced popular versions of arcade winners like *Space Invaders* and *Asteroids* in the past and here they are repeating the successful formula with a version of *Androids*

You must find your way around several electrified rooms, killing the lumbering metal robots that you find there The robots, though, seem to be the least of your problems as later levels feature both exploding pods and Evil Orville the Minelayer

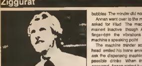


Program *Frenzy*
Price *£4 95*
Micro *Spectrum 16/48K*
Supplier *Quicksilva*
Palmerston Park House
13 Palmerston Road
Southampton SO1 1LL





New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 12 Whitcomb Street London WC2 7HF



The moving finger

Annan's deafness came suddenly. One day he was well, the next the virus made him so very ill. And then, within the week, he was totally deaf — so deaf, and in such a manner, that he could not even hear himself when he spoke.

The machines they used to examine him pronounced his deafness neural and irrepairable. He was so alone, so cut off from the world.

They had tried to provide a hearing machine but the buzz in his ears went far beyond the capacity of machines. For a while he had been able to talk to them — all too short a while. But as time progressed they seemed to understand less and less. As he could never be sure how much they had understood in the first place, it was possible they had never heard correctly.

How was he to escape from this terrible isolation?

Annan asked for a drink — the person smiled but did not understand. Annan motioned with his hand near his lips and the machine minder then knew what was wanted. The minder went to the wall and spoke to the drinks machine. A portion of cannol was produced. As he could not stand the taste of cannol, Annan waved the drink wearily away.

He looked around for inspiration and saw the plants at the side of his bed. There was space between the plants and so in the soil he drew a mug filled with liquid and hoped the machine minder would realise that the indentations Annan made in the liquid were in fact tilud bubbles. The minder did not realise.

Annan went over to the machine himself and asked for tilud. The machine, however, remained inactive, though Annan felt with his finger-tips the vibrations coming from the machine's speaking point.

The machine minder sorrowfully shook his head, smiled his inane smile, and proceeded to ask the dispensing machine for all manner of possible drinks. When the tilud eventually appeared Annan picked it up and drank it down — too sweet!

Later they brought Annan a tray of fine sand so that he could, where possible, draw a picture of what he wanted. It was clear that Annan would remain in intensive care at the medical facility for life. He could not operate even the simplest of machines for, being deaf, he could not talk to the machines, or hear what they had to say.

All around were machines, yet he was so isolated.

How could he reach out to the machines, and to the machine minders? The sand tray was so limiting, because the image analyser had difficulty in coping with his scribbles, though sometimes the minder was able to decipher them. When they brought Annan a make-up stick, and pieces of white flat machine casing, his scribbles became clearer, and easier for the image analyser to interpret.

Annan — the designer of machines, a person who had felt superior to mere machine minders — was truly helpless. If Annan could speak, he would be able to instruct his design machine to design a machine to help him.

One day, feeling independent, Annan went for a walk, and managed to progress quite far in the complex of the medical facility. He continued, with doors opening at his approach, until he came to one which would not open. He asked the safety door to open several times. At last it opened.

He thanked the door, but it misunderstood his command. Immediately closing on him, it crushed him to death. ■

Boris Allan

Puzzle

Perfectly balanced . . .

Puzzle No 53

Twelve weights are distributed in the two pans of a set of hand scales in such a way that a perfect balance is obtained.

The weights are all spheres of solid gold and their diameters range from 1 centimetre to 12 centimetres in regular one-centimetre steps.

If all the weights are used and six are placed in each pan, how are they arranged?

Solution to Puzzle No 46

Although the dartboard contains only seven sections, since doubles and trebles are allowed this increases the number of possible scores to twenty-one.

```
10 DIM A(18) 20 A(1) = 11 30 A(2) = 13 40 A(3) = 31
50 A(4) = 33 60 A(5) = 42 70 A(6) = 44 80 A(7) = 46
90 FOR I = 8 TO 14 100 LET A(I) = A(I - 7)*2 110
NEXT I 120 FOR I = 15 TO 18 130 LET A(I) = A(I -
14)*3 140 NEXT I 150 FOR I = 1 TO 18 160 FOR J =
1 TO 18 170 X = A(I) + A(J) 180 IF X = 118 THEN
PRINT "TWO DARTS ",A(I) A(J) 190 Y = 118 - X
200 FOR K = 1 TO 18 210 IF Y = A(K) THEN PRINT
"THREE DARTS " A(I) A(J) A(K) 220 NEXT K 230
NEXT J 240 NEXT I
```

Lines 10 to 140 set up the array of possible dart values (treble 42, 44 and 46 are not included). Lines 150 to 190 test values of the first two darts and print any which total 118. Lines 190 to 210 test values for three darts which total 118.

This program gives the results. There is only one combination of two darts which can win and six different combinations of three darts: Double 46, double 13, 13; double 33, treble 13, double 13; double 13, double 33; 46, 46, double 13, 13; 13, double 46, 46; treble 11, treble 13 and 46; 33, treble 13. Each of these winning combinations can be thrown in any order. The safest combination to aim for is the two-dart combination since that way you have a spare dart in case of error!

Winner of Puzzle No 48

The winner is Peter Story, Priestfields, Rochester, Kent, who receives £10.



Top 10

Atari

1	(4)	Zaxxon	(Datasoft)
2	(—)	Necromancer	(Synapse)‡
3	(—)	Miner 2049er	(Big Five)*
4	(—)	The Scott Adams Adventures	(Adventure International)†
5	(—)	Qix	(Atari)
6	(1)	Defender	(Atari)*
7	(—)	GFS Sorceress	(Avalon Hill)§
8	(3)	Astro Chase	(First Star)‡
9	(—)	Protector	(Synapse)‡
10	(5)	Eliminator	(Adventure International)

*Cartridge †24K cassette ‡32K cassette §48K cassette.

(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Spectrum

1	(1)	Penetrator	(Melbourne House)
2	(2)	The Hobbit	(Melbourne House)
3	(—)	Test Attack	(Computer Rentals)
4	(—)	Football Manager	(Addictive Games)
5	(8)	Time Gate	(Quicksilva)
6	(7)	Assembler Editor	(Picturesque)
7	(4)	Do Not Pass Go	(Workforce)*
8	(5)	Galaxians	(Artic)
9	(—)	3D Tanx	(DK 'Tronics)
10	(—)	Ferrari Glass Skiing	(Psion)

*Requires 48K.

(Figures compiled by Buffer Micro Shop, London 01 769 2887)

ZX81*

1	(1)	Flight Simulation	(Psion)
2	(—)	Froggy	(DJL)
3	(—)	ZXAS Assembler	(Bug-Byte)
4	(3)	Black Crystal	(Carnell)
5	(—)	Adventure 1	(Abersoft)
6	(8)	3D Monster Maze	(JK Greye)
7	(2)	Cube 2	(Campbell Systems)
8	(9)	Chess II	(Artic)
9	(—)	Espionage Island	(Artic)
10	(—)	Rovian Physics	(Sci Soft)

*All 16K.

(Figures compiled by Buffer Micro Shop, London 01 769 2887)

Dragon

1	(1)	Donkey King	(Microdeal)
2	(3)	Katerpillar Attack	(Microdeal)
3	(2)	Dragon Trek	(Salamander)
4	(9)	Ramble	(Automata)
5	(6)	Champions	(Peaksoft)
6	(4)	Planet Invasion	(Microdeal)
7	(—)	Phantom Slayer	(Microdeal)
8	(5)	Space Race	(Compusense)
9	(10)	Cosmic Zap	(Microdeal)
10	(9)	Attack	(PSS)

(Figures compiled by Dragon Dungeon, Ashbourne 0335 44626)

BBC*

1	(—)	Meteors	(Acornsoft)
2	(4)	Chess	(Computer Concepts)
3	(7)	Philosopher's Quest	(Acornsoft)
4	(—)	Monsters	(Acornsoft)
5	(—)	Sphinx Adventure	(Acornsoft)
6	(—)	Wizzard	(IJK)
7	(3)	Snapper	(Acornsoft)
8	(6)	Chess	(Program Power)
9	(—)	Space Wars	(Bug-Byte)
10	(—)	Early Learning	(BBC)

*All Model B

(Figures compiled by Micro Management, Ipswich 0473 59181)

Vic-20

1	(3)	Abductor	(Llamasoft)
2	(1)	Grid Runner	(Llamasoft)
3	(4)	Space Phreeks	(Rabbit)
4	(8)	Alien	(Commodore)*
5	(10)	Colonel's House	(Rabbit)‡
6	(9)	Shark Attack	(Romik)
7	(—)	Galactic Crossfire	(Rabbit)
8	(2)	Laser Zone	(Llamasoft)†
9	(6)	Traxx	(Llamasoft)†
10	(—)	Adventure Pack 1	(Rabbit)

*Cartridge †Requires 8K or 16K ‡16K only

(Figures compiled by Vic Centre, London 01-992 0336)

Books

1	(—)	Complete Spectrum ROM Disassembly, *Logan*	(Melbourne House)
2	(1)	Enter the Dragon, *Carter*	(Melbourne House)
3	(7)	The BBC Micro — An expert guide, *James*	(Granada)
4	(—)	Spectrum Hardware Manual, *Dickens*	(Melbourne House)
5	(3)	Assembly Language Programming for the BBC Microcomputer, *Birnbaum*	(Macmillan)
6	(—)	Mastering the Vic20, *Jones*	(Sigma)
7	(5)	The Power of the Dragon, *Shaw*	(Microsource)
8	(2)	Spectrum Machine Language for the Absolute Beginner, *Tang*	(Melbourne House)
9	(6)	Compute!'s First Book of Vic, various authors	(Compute!)
10	(—)	Complete Forth, *Winfield*	(Sigma)

(Figures compiled by Watford Technical Books, Watford 0923 23324)

(Last week's position in brackets)

SOFTWARE
exclusive

AUTOMATA

"THE NAKED TRUTH"

From their seaside sun-kissed top-floor office suite overflowing with green plants, fresh-ground coffee and an Irish setter we interviewed AUTOMATA the soft ware whose adventure quest "PIMANIA" has reached cult status and whose slogan is "we put some TIME in computing"

We were going to tell you that AUTOMATA is a small cooperative committed to non violent games who want to give as much back to our customers as we can in the way of prizes and entertainment, but we know you wouldn't fall for any of that old garbage So here it is the Naked Truth

We're just ordinary people with the usual computer background- Grosvenor, the SAS, House of Lords (that is the cleaners) and we are no exception to the current trend of young personnel our marketing director is a 9 year old parrott from Milton Keynes, and the majority of our programmers are day old-chicks that we buy wholesale from the Youth Opportunities Scheme and Ministry of Defence We used to make sticking plasters but found that computer games were easier to rip off

It s been a long hard struggle We started out with virtually no experience a week last Tuesday, and it wasn t 'til the Saturday afternoon that we moved into our penthouse and opened our first chain of software outlets (mobile ice-cream vans, deep-fried woolen under-clothing we made a few mistakes back then) Suddenly we hit big trouble At the peak of our success, half our directors quit taking our best programmers with them We were forced to break tradition with the normal softwarehouse practice of issuing the same program once a week under a different title We nearly went bankrupt but in the nick of time we hit on this great publicity gimmick of giving away a prize of £6 million which we didn't have because it belonged to some american So then we changed it to a prize of a free trip for 6 million people to a well known German woodland resort The program was really imaginative players had to solve ten incredibly difficult riddles like 'who wrote Beethoven s Fifth It took us literally minutes to write the program, and hours to hide the receipts from the VAT man

Anyway, we had to wait until Tuesday morning for our big break when we clinched the sale of 123 million 'PIMANIA tapes to W H S , or was it Iran The rest as they say is history We're at Number One to Fifty inclusive in the Software Sales Charts,& feel this is the proper reward for working out which individual salesman in the one shop the magazines base these charts on and then sending in our grannies to buy up all our own stuff

(Please don't print that by the way or we'll break your legs, no offence pal)

Sometimes things get really exciting here at AUTOMATA For example, the other day we learned how to spell 'Hobbit and one of us has just discovered where to insert our 16K RAMpack So the public can be sure of some fantastic new programs,as soon as the pubs shut On a serious note we wish to say a short word about Software Libraries, but you have already refused to print it This of course does not morally conflict with our own buy-back Scheme, wherein we hire you any program in the world for 10p lend you the tape recorder to copy it while you wait and buy back the cassette for 49 pence,

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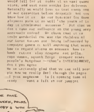
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5



AUTOMATAS HEAD PROGRAMMER before his tragic accident with an advertising salesman

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